NAVSHIPS 91906

INSTRUCTION BOOK

for

RADIO RECEIVING SET AN/URR-35

FEDERAL TELEPHONE AND RADIO CORPORATION
CLIFTON, NEW JERSEY

BUREAU OF SHIPS NAVY DEPARTMENT

Contract: NObsr-57142 *Approved by BuShips: 10 APRIL 1953*

LIST OF EFFECTIVE PAGES

PAGE NUMBERS	CHANGE IN EFFECT	PAGE NUMBERS	CHANGE IN EFFECT
Title Page	Original	4–1 to 4–4	Original
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DEPARTMENT OF THE NAVY
BUREAU OF SHIPS
WASHINGTON 25, D. C.

IN REPLY REFER TO
Code 993-100
10 April 1953

From: Chief, Bureau of Ships
To: All Activities Concerned with the Installation, Operation and Maintenance of the Subject Equipment

Subj: Instruction Book for Radio Receiving Set AN/URR-35 NAVSHIPS 91906

1. This is the instruction book for the subject equipment and is in effect upon receipt.

2. When superseded by a later edition, this publication shall be destroyed.

3. Extracts from this publication may be made to facilitate the preparation of other Department of Defense Publications.

4. All Navy requests for NAVSHIPS Electronics publications should be directed to the nearest District Publications and Printing Office. When changes or revised books are distributed, notice will be included in the Bureau of Ships Journal and in the Index of Bureau of Ships General and Electronics Publications, NAVSHIPS 250-020.

H. N. WAILLIN
Chief of Bureau

RECORD OF CORRECTIONS MADE

CHANGE NO.	DATE	SIGNATURE OF OFFICER MAKING CORRECTION

Date: 19 June 1953

TEMPORARY CORRECTION T-1
TO
INSTRUCTION BOOK
FOR
RADIO RECEIVING SET
AN/URR-35
(NAVSHIPS 91906)

Contract: NObsr-57142 (dated 14 JAN. 1952)

Equipments affected: All.

CHANGES

Page	Item
2-4	On figure 2-4 change the values of R104 and R108 from 3300 1 W to 4700 2 W.
7-37 7-38	On figure 7-28 change the values of R104 and R108 from 3300 1 W to 4700 2 W.
8-17	Change R104 as follows:

Reference Designation	Stock Nos. (1)Signal Corps. (2)Standard Navy (3)Air Corps	Name and Description	Locating Function
R104	N16-R-50130-469	RESISTOR, fixed: comp; JAN type RC42BF472K; 4700 ohms ±10%; 2 w; spec JAN-R-11.	Plate voltage dropping (1st RF)

Page	Item
8-28	Delete SNSN N16-R-50067-231 (reference symbol R104) and insert SNSN N16-R-50130-469.
8-29	Delete RC30BF332K (reference symbol R104) and insert RC42BF472K.

FEDERAL TELEPHONE AND RADIO CORPORATION
CLIFTON, NEW JERSEY

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GUARANTEE

The equipment, including all parts and spare parts, except vacuum tubes, batteries, rubber and material normally consumed in operation, is guaranteed for a period of one year from the date of delivery of the equipment to and acceptance by the Government with the understanding that all such items found to be defective as to material, workmanship or manufacture will be repaired or replaced, f.o.b. any point within the continental limits of the United States designated by the Government, without delay and at no expense to the Government; provided that such guarantee will not obligate the Contractor to make repair or replacement of any such defective items unless the defect appears within the aforementioned period and the Contractor is notified thereof in writing within a reasonable time and the defect is not the result of normal expected shelf life deterioration.

To the extent the equipment, including all parts and spare parts, as defined above, is of the Contractor's design or is of a design selected by the Contractor, it is also guaranteed, subject to the foregoing conditions, against defects in design with the understanding that if ten percent (10%) or more of any such said item, but not less than two of any such item, of the total quantity comprising such item furnished under the contract, are found to be defective as to design, such item will be conclusively presumed to be of defective design and subject to one hundred percent (100%) correction or replacement by a suitably redesigned item.

All such defective items will be subject to ultimate return to the Contractor. In view of the fact that normal activities of the Naval Service may result in the use of equipment in such remote portions of the world or under such conditions as to preclude the return of the defective items for repair or replacement without jeopardizing the integrity of Naval communications, the exigencies of the Service, therefore, may necessitate expeditious repair of such items in order to prevent extended interruption of communications. In such cases the return of the defective items for examination by the Contractor prior to repair or replacement will not be mandatory. The report of a responsible authority, including details of the conditions surrounding the failure, will be acceptable as a basis for effecting expeditious adjustment under the provisions of this contractual guarantee.

The above one year period will not include any portion of time the equipment fails to perform satisfactorily due to any defects, and any items repaired or replaced by the Contractor will be guaranteed anew under this provision.

INSTALLATION RECORD

Contract Number NObsr–57142 Date of Contract, 14 January 1952

Serial Number of equipment .....

Date of acceptance by the Navy .....

Date of delivery to contract destination .....

Date of completion of installation .....

Date placed in service .....

Blank spaces on this page shall be filled in at time of installation.

REPORT OF FAILURE

Report of failure of any part of this equipment, during its entire service life, shall be made to the Bureau of Ships in accordance with current regulations using form NAVSHIPS NBS 383 (revised). The report shall cover all details of the failure and give the date of installations of the equipment. For procedure in reporting failures see Chapter 67 of the *Bureau of Ships Manual* or superseding instructions.

ORDERING PARTS

All requests or requisitions for replacement material should include the following data:

1. Federal stock number or, when ordering from a Marine Corps or Signal Corps supply depot, the Signal Corps stock number.
2. Name and short description of part.

If the appropriate stock number is not available the following shall be specified:

1. Equipment model or type designation, circuit symbol, and item number.
2. Name of part and complete description.
3. Manufacturer's designation.
4. Contractor's drawing and part number.
5. JAN or Navy type number.

DESTRUCTION OF ABANDONED MATERIAL IN THE COMBAT ZONE

In case it should become necessary to prevent the capture of this equipment, and when ordered to do so, DESTROY IT SO THAT NO PART OF IT CAN BE SALVAGED, RECOGNIZED, OR USED BY THE ENEMY. BURN ALL PAPERS AND BOOKS.

Means:

1. Explosives, when provided.
2. Hammers, axes, sledges, machetes, or whatever heavy object is readily available.
3. Burning by means of incendiaries such as gasoline, oil, paper or wood.
4. Grenades and shots from available firearms.
5. Burying all debris, where possible and when time permits.
6. Throwing overboard or disposing of in streams or other bodies of water.

Procedure:

1. Obliterate all identifying marks. Destroy nameplates and circuit labels.
2. Demolish all panels, castings, switch and instrument boards.
3. Destroy all controls, switches, relays, connections and meters.
4. Rip out all wiring and cut interconnections of electrical equipment. Smash gas, oil, and water cooling systems in gas engine generators, etc.
5. Smash every electrical or mechanical part, whether rotating, moving or fixed.
6. Break up all operating instruments such as keys, phones, microphones, etc.
7. Destroy all classes of carrying cases, straps, containers, etc.
8. Bury or scatter all debris.

DESTROY EVERYTHING!

SAFETY NOTICE

The attention of officers and operating personnel is directed to Chapter 67 of the *Bureau of Ships Manual* or superseding instructions on the subject of radio-safety precautions to be observed.

This equipment employs voltages which are dangerous and may be fatal if contacted by operating personnel. Extreme caution should be exercised when working with the equipment.

While every practicable safety precaution has been incorporated in this equipment, the following rules must be strictly observed:

KEEP AWAY FROM LIVE CIRCUITS:

Operating personnel must at all times observe all safety regulations. Do not change tubes or make adjustments inside equipment with high voltage supply on. Under certain conditions dangerous potentials may exist in circuits with power controls in the off position due to charges retained by capacitors. To avoid casualties always remove power and discharge and ground circuits prior to touching them.

DON'T SERVICE OR ADJUST ALONE:

Under no circumstances should any person reach within or enter the enclosure for the purpose of servicing or adjusting the equipment without the immediate presence or assistance of another person capable of rendering aid.

DON'T TAMPER WITH INTERLOCKS:

Do not depend upon door switches or interlocks for protection but always shut down motor generators or other power equipment. Under no circumstances should any access gate, door, or safety interlock switch be removed, short-circuited, or tampered with in any way, by other than authorized maintenance personnel, nor should reliance be placed upon the interlock switches for removing voltages from the equipment.

RESUSCITATION

AN APPROVED POSTER ILLUSTRATING THE RULES FOR RESUSCITATION BY THE PRONE PRESSURE METHOD SHALL BE PROMINENTLY DISPLAYED IN EACH RADIO, RADAR, OR SONAR ENCLOSURE. POSTERS MAY BE OBTAINED UPON REQUEST TO THE BUREAU OF MEDICINE AND SURGERY.

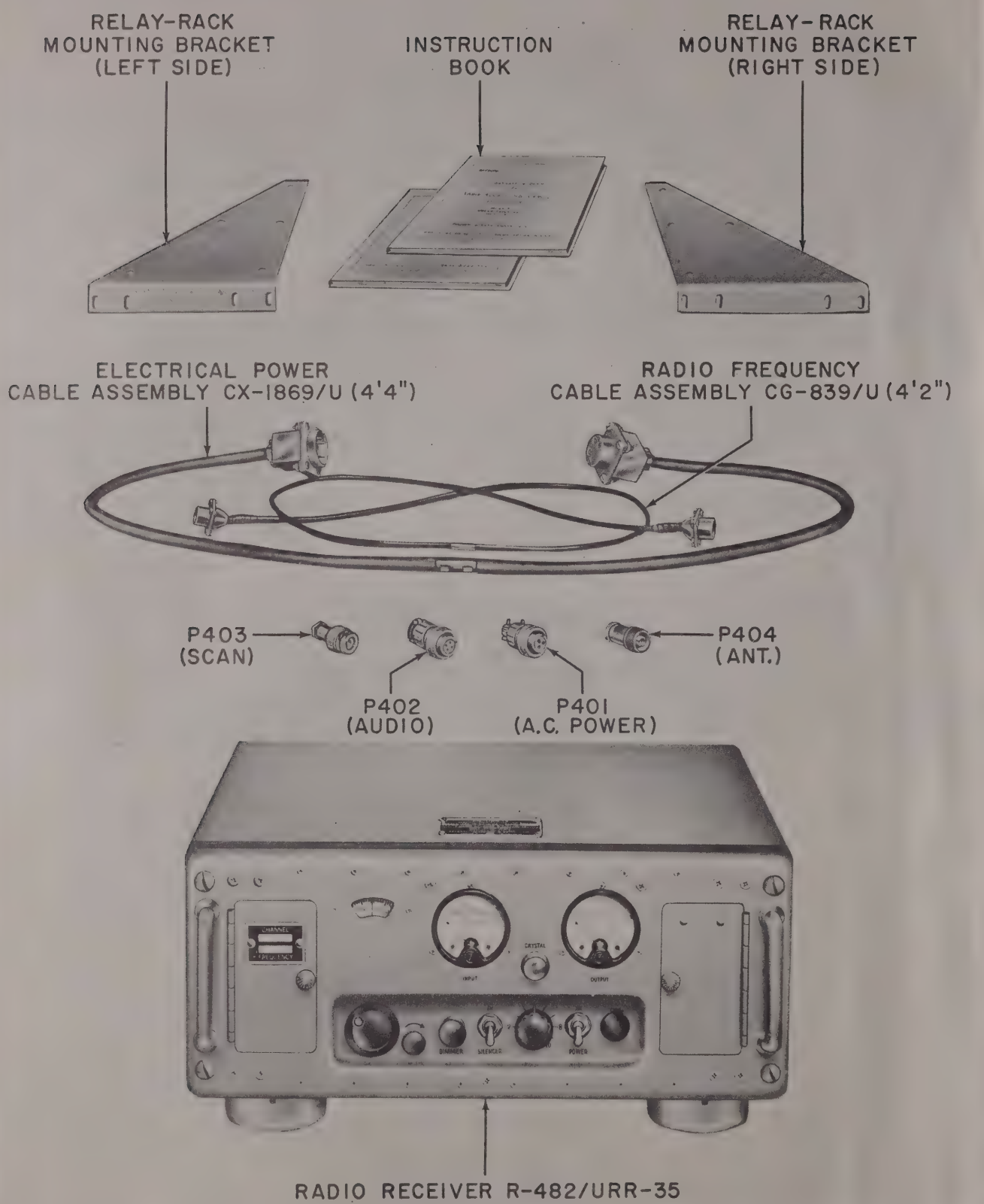


Figure 1–1. Radio Receiving Set AN/URR–35

SECTION 1
GENERAL DESCRIPTION

1. INTRODUCTION.

This instruction book describes the circuit theory, installation, operation and maintenance of Radio Receiving Set AN/URR–35.

2. DESCRIPTION.

a. PURPOSE.—Radio Receiving Set AN/URR–35 is designed to provide means for reception of amplitude-modulated (A–3) voice and MCW (A–2) transmission in the 225–400 megacycle frequency range. The receiver may be used on Naval vessels, at Naval air and shore radio stations, or at other units of the military establishment.

b. BASIC PRINCIPLES OF OPERATION.—Radio Receiving Set AN/URR–35 is a VHF/UHF, double-superheterodyne type of receiving equipment, designed primarily for operation as a pretuned, single-channel, crystal-controlled receiver. By employing a suitable crystal, any channel within the frequency range of the receiver may be selected. Provisions are also made for continuously variable manual tuning. A single tuning control is employed for tuning to any frequency for either crystal-controlled or manual tuning operation. Either one of these two methods of operation may be selected by means of the panel-mounted OSC. switch.

The receiver has a sensitivity of better than 8 microvolts in series with 50 ohms for a 10-db signal-to-noise ratio. Intermediate frequencies of 18.6 and 1.775 megacycles are employed. Provisions are made for connecting a panoramic-type radio receiver, to provide a visual picture of the received signal. The scanning channel has a band width of 300 to 1000 kilocycles between the half-voltage (—6 db) points.

All power necessary for operation of the equipment is obtained from a built-in power supply which can be adjusted to operate from a 105-, a 115- or a 125-volt, 50/60-cps, single-phase source. The audio and power source connections to the receiver are filtered to limit possible radio-frequency interference.

c. EQUIPMENT ARRANGEMENT. — Radio Receiving Set AN/URR–35 is shown in figure 1–1. It consists of Radio Receiver R–482/URR–35, a pair of auxiliary angle brackets for relay-rack mounting, four plugs to mate with receptacles on the receiver for external connections, Electrical Power Cable Assembly CX–1869/U, Radio Frequency Cable Assembly CG–839/U, and two copies of the instruction book. The receiver proper consists of a panel, frame and chassis assembly housed in a cabinet fitted with shockmounts. The equipment may be mounted on a bench or other firm horizontal surface, or (by attaching brackets) in a standard 19-inch relay rack.

The circuit components are grouped, on a functional basis, into five major sections—the preselector, IF/AF, power supply, front panel and cable filtering sections. The first three sections are assembled within the chassis frame, and the front panel section is attached to the front of this frame. The cable filtering section (Low-Pass Filter F–218/URR–35) is mounted against the rear wall of the cabinet. The preselector section consists of the r-f amplifier-converter and the oscillator-multiplier sub-sections. The ganged tuning capacitors in the two sub-sections are geared together through a common dial-drive assembly. The receiver is tuned by means of a single front-panel tuning control.

All primary operating controls and the meters are mounted on the front panel; see figure 1–2. The crystal, the fuses and those controls which require only periodic change for operational adjustments are in panel compartments accessible through hinged doors. Trimmer adjustment controls are readily accessible when the chassis assembly is removed from the cabinet. Trimmer adjustments in the r-f amplifier and oscillator-multiplier sections are accessible through holes located in the casting walls and in the top cover shields of the preselector unit. Trimmer adjustments for circuits in the i-f section are located at the tops (accessible through holes in the shields) and bottoms of the i-f transformer assemblies. Cable connections to and from the receiver are made to connectors on the underside of the low-pass filter attached to the rear of the cabinet. A phone jack is mounted on the front panel.

The equipment is supplied with full complement of tubes and fuses installed. The tube complement is summarized in table 1–4.

3. DESCRIPTION OF MAJOR COMPONENTS.

a. CABINET.—The receiver cabinet is fabricated from an aluminum alloy and finished in a gray enamel; see figures 1–2 and 1–3. Guide rails, located on the bottom of the cabinet, permit easy withdrawal of the panel-and-chassis assembly. When installed in a standard relay rack, the angle brackets used for mounting it are attached to the sides of the cabinet and the four shockmounts are removed. When the cabinet is arranged for table mounting, these brackets are detached and four shockmounts are bolted to the bottom of the cabinet in their stead. Ventilation is provided, through dust filters and louvers on either side of the cabinet, by means of an internal blower.

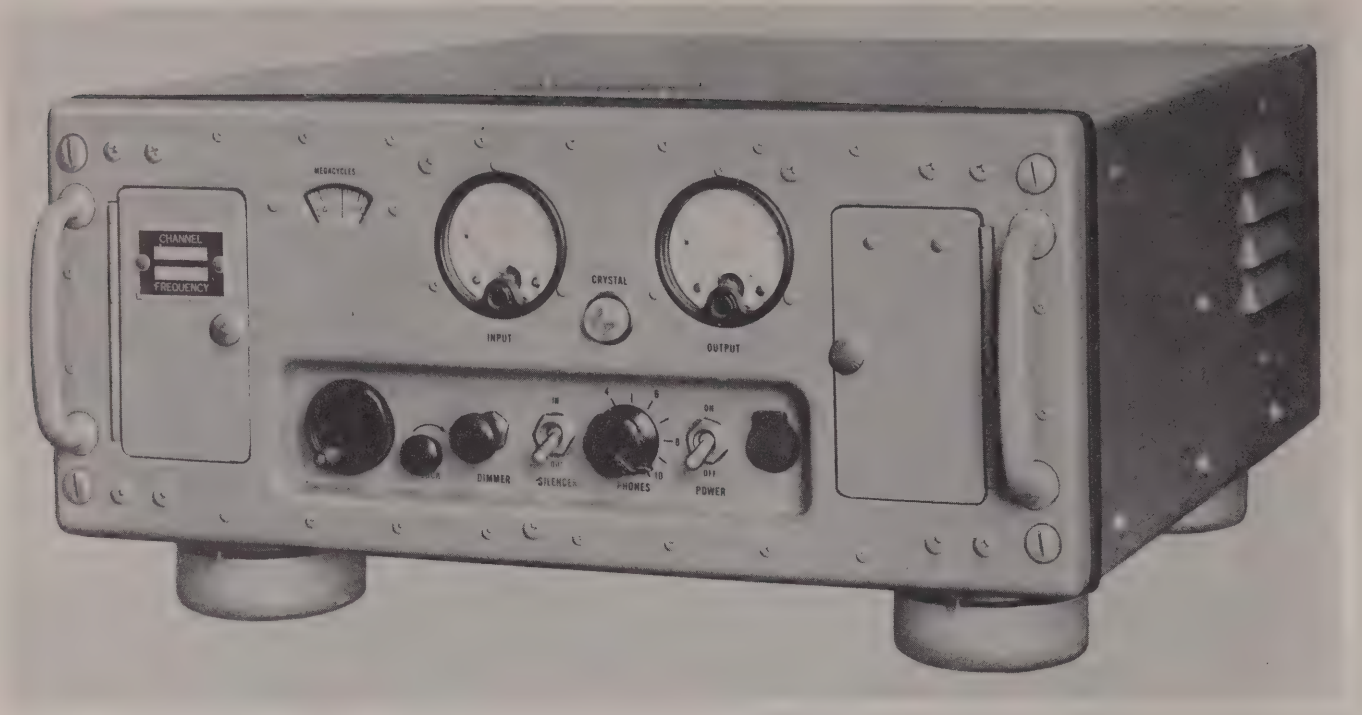


Figure 1–2. Radio Receiver R–482/URR–35, Front View

b. FRONT PANEL AND CHASSIS FRAME ASSEMBLY.—An aluminum frame, attached to the front panel, mounts the preselector, IF/AF and power supply chassis to form a complete chassis assembly; see figure 1–4. The panel is finished in a gray enamel, which blends with the color of the cabinet and is fitted with handles to permit withdrawal of the panel-and-chassis assembly from the cabinet. A spring-stop mechanism on each side permits nearly complete withdrawal of the chassis from the cabinet, but prevents its falling out due to roll, tilt, shock or vibration. When these stop mechanisms are pressed upward by the fingers through holes in the bottom of the chassis frame, the panel-and-chassis assembly may be completely withdrawn. The two hinged doors on either side of the front panel are held closed by knurled-head spring fasteners. These are released by a half-turn to the left, giving access to crystals, fuses and the semi-fixed controls or adjustments.

c. PRESELECTOR SECTION. (*See figures 1–4, 2–2 and 2–3.*)—The preselector section is mounted along the left side of the chassis frame, and comprises all parts of the r-f amplifier-converter and oscillator-multiplier sections. The r-f amplifier section is above the oscillator-multiplier section, and each consists of an aluminum casting with removable covers. The two r-f amplifier stages and the mixer, or first detector, are mounted in the r-f amplifier-converter section. The basic oscillator, two frequency-doubler stages and a frequency-tripler stage are mounted in the oscillator-multiplier section. Partitions in the castings provide r-f shielding between stages.

The five-section, signal-frequency tuning capacitor (C101) in the r-f amplifier-converter section and the four-section tuning capacitor (C102) in the oscillator-multiplier section are geared together to synchronize their rotation. Each of these ganged capacitors consists of a number of split-stator sections, and of an equal number of rotor sections mounted on a common metal shaft. Wiping contacts ground the shaft to the casting wall. The effective rotation of the ganged capacitors is 85 degrees.

The tuning inductances for the r-f amplifier sections and for the multiplier-tripler section consist of semi-circular strips of invar. The adjustable trimmer inductances consist each of two parallel rods and an adjustable shorting bar. These inductances and the concentric-cylinder trimmer capacitors are integral parts of the ganged capacitor sections. The tuning capacitors for the basic oscillator and for the two doubler stages are similar in construction. The oscillator coil is of ceramic construction to provide a high degree of stability with temperature variations. The doubler coils are space-wound solenoids on mica-filled bakelite forms.

All the tube sockets are mounted directly over the related sections of the ganged tuning capacitors to reduce lead lengths to a minimum.

d. DIAL-DRIVE ASSEMBLY. — Tuning is accomplished by a smooth and free-running gear train mechanism employing spring-loaded gears to insure freedom from backlash. This mechanism provides an effective 19-to-1 reduction ratio between the tuning crank on the front panel and the main drive shaft of

the preselector, with automatic mechanical stops at each end of the range. With this arrangement, 19 complete revolutions of the tuning crank rotates the calibrated dial through 340 degrees, and turns the ganged capacitors through their full 85 degrees of rotation, thereby covering the entire 225–400 megacycle frequency band of the receiver.

The main tuning indicator dial is 2-5/8 inches in diameter and is calibrated directly in megacycles. Markings appear at each two-megacycle division, with each fifth marking indexed, and each tenth marking identified with the appropriate frequency numerals. Rotation of the tuning crank in a clockwise direction increases the frequency. A locking device is included to permit locking the tuning drive mechanism at any desired frequency setting.

The calibrated dial is illuminated by two 6-volt pilot lamps mounted behind the panel. A DIMMER control potentiometer, mounted on the front panel, permits control of the brilliance of the dial lamps. These dial lamps are located directly above the dial-drive assembly, behind the front panel.

e. IF/AF SECTION. — The IF/AF section of the chassis is shown in figure 1–4. It is located on the right-hand side of the chassis frame, and mounts the second mixer and oscillator, the i-f stages, the a-f detector, the automatic-gain-control (AGC) circuit, the silencer circuit, the noise-limiter circuit, and the three stages of audio amplification.

f. POWER SUPPLY SECTION.—The power supply section of the chassis, shown in figure 1–4, is mounted

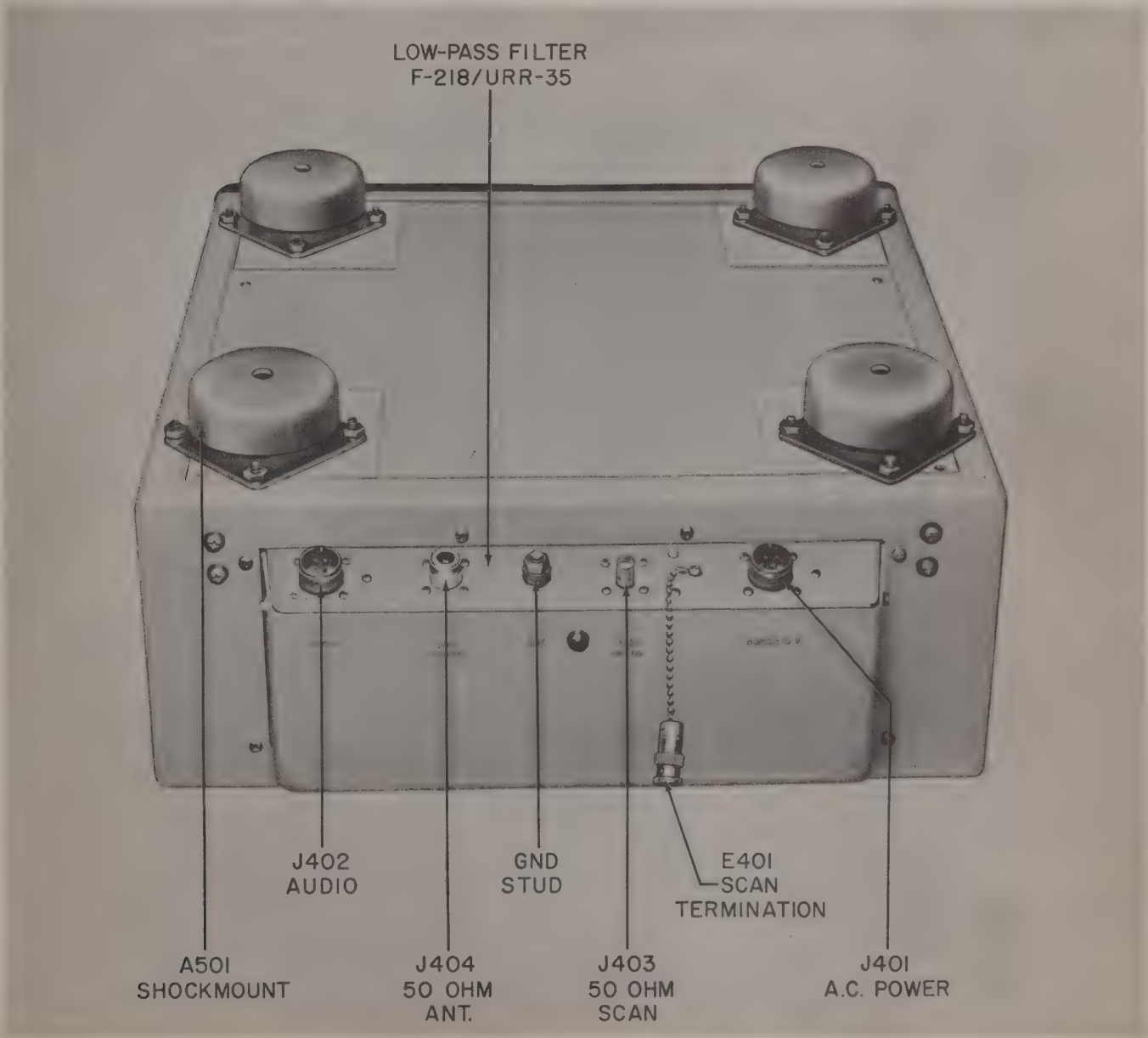


Figure 1–3. Radio Receiver R–482/URR–35, Rear View (Upside Down) Showing Low-Pass Filter F–218/URR–35

at the rear of the IF/AF section. It includes all the circuit parts necessary to provide the a-c and d-c voltages required for operation of the equipment from a source of 105/115/125-volt, 50/60-cps, single-phase power.

The power transformer and the filter parts are designed to provide a power supply of reduced size and weight in comparison with the power requirements. The blower is also mounted on this chassis.

g. LOW-PASS FILTER F–218/URR–35.—The low-pass filter is shown in figure 1–3. It contains r-f noise-filter circuits for the audio output and power input circuits, and provides through connections from the receiver proper to the antenna input and scan-channel output circuit connectors. The filter parts are mounted on a base plate which is attached to the rear wall of the receiver cabinet by means of snap-slide fasteners located on the inside of the cabinet. The filter cover, when attached to the base plate, constitutes an r-f shield. The A.C. POWER input (J401), AUDIO output (J402), 50 OHM SCAN channel output (J403) and 50 OHM ANT. transmission line input (J404) connectors, to which all external connections except headphones are made, are mounted on the underside of the filter assembly on an angle bracket attached to the base plate. When the receiver panel-and-chassis assembly is slid into the cabinet, three connectors (plugs) on the rear of the receiver engage mating connectors (receptacles) on the rear of the filter base plate, establishing connections between the external and internal receiver circuits. The filter components are made accessible for servicing by removal of the filter cover, without removing the filter from the receiver cabinet.

Connector plugs P401 through P404 (see figure 1–1) are supplied with the equipment for use as required. Through connectors P401 and J401, a-c power is sup-

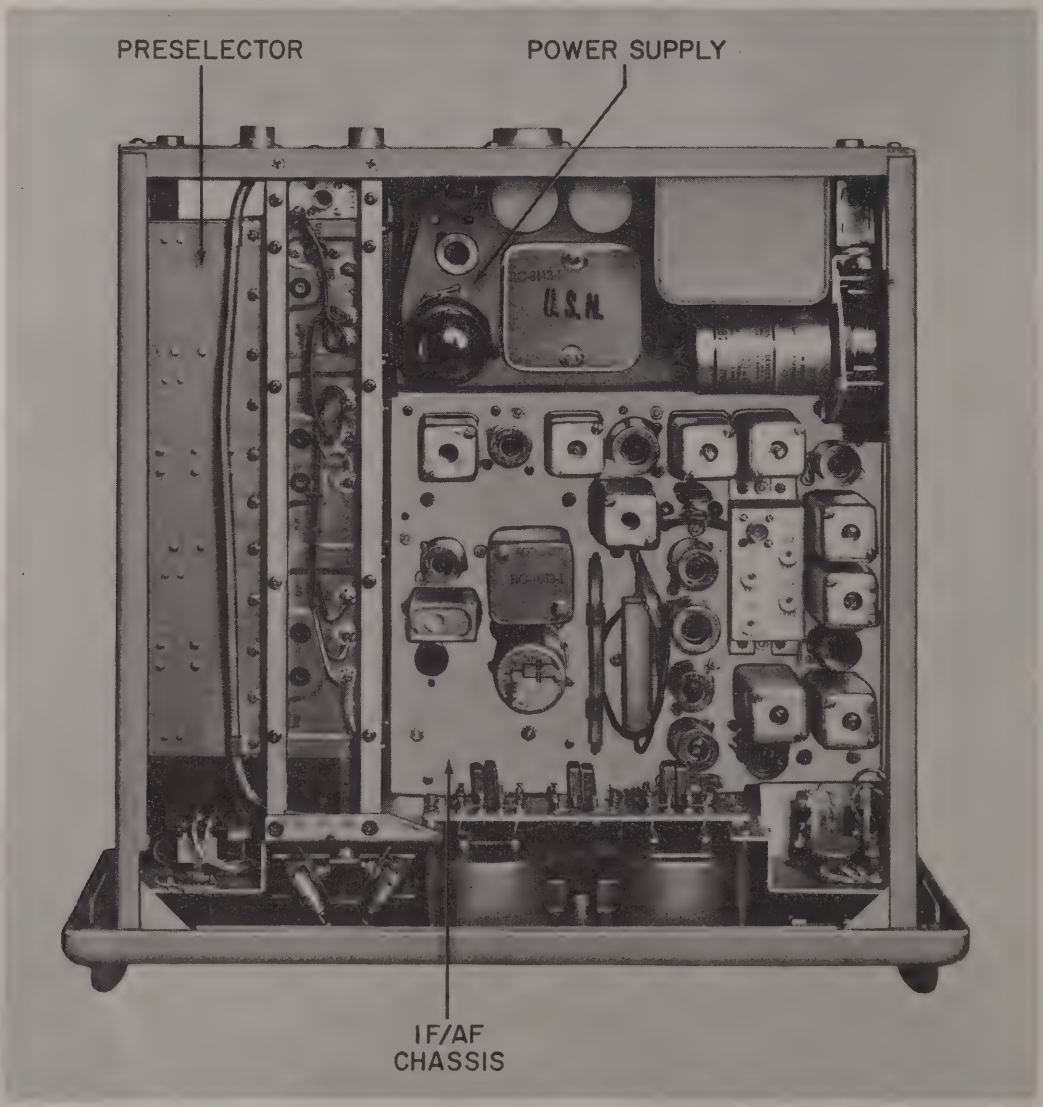


Figure 1–4. Radio Receiver R–482/URR–35, Identification of Major Subassemblies

plied to the equipment. Through connectors P402 and J402, the audio-output signal may be applied to a 600-ohm line. Through connectors P403 and J403, an output signal may be made available for use in a panoramic-type radio receiver, and the input signal from the antenna is brought to the receiver through connectors P404 and J404. In each case, external cables for these connectors must be fabricated to fit local conditions.

b. TEST CABLE ASSEMBLIES.—Two test cable assemblies, shown in figure 1–1, are supplied with the equipment for use during maintenance procedures. When the receiver is removed from the cabinet during such procedures, these cable assemblies are used to connect the connector plugs on the rear of the receiver to the receptacles on the base plate of the low-pass filter; refer to preceding subparagraph *g*. Radio Frequency Cable Assembly CG–839/U (W601) connects the antenna input connector on the rear of the receiver chassis to the antenna input circuit of the filter assembly. Electrical Power Cable Assembly CX–1869/U (W602) connects the receiver power and audio circuits to the filter assembly.

4. ASSOCIATED EQUIPMENT.

The components and parts described below are not supplied, but are required to complete the installation of Radio Receiving Set AN/URR–35.

a. ANTENNA.—The antenna to be used with this receiver must be designed to have an impedance of approximately 50 ohms with characteristics that result in good matching with the transmission line over the frequency range of 225–400 megacycles. Antenna AT–150/SRC or AS–390/SRC will fulfill these requirements. The applicable installation plan will indicate the particular type of antenna to be used.

One rod or the ground plane is grounded to the supporting tube and the outer conductor of the coaxial transmission line. The "line" radiator extending vertically is supported by an insulated stud connected to the center lead of the antenna.

b. ANTENNA TRANSMISSION LINE.—A coaxial transmission line having a nominal characteristic impedance of about 50 ohms is required for connection between the antenna and the receiver. The applicable installation drawings indicate the type to be used for this purpose.

c. SCAN CIRCUIT.—The 50 OHM SCAN connector (J403) on the cable filter at the rear of the cabinet can be connected to a panoramic-type radio frequency scanning adapter to provide visual indication of the signals being picked up by the receiver. The scanning channel has a bandwidth of 300 to 1000 kc. If scanning equipment is used, a nominal 50-ohm coaxial transmission line, such as type RG–58/U cable, should be employed. However, no such equipment is supplied with Radio Receiving Set AN/URR–35, and none is required for its satisfactory operation as a receiver.

When the scan channel is not in use, scan-channel termination E401 must be connected to the 50 OHM SCAN connector (J403); see figure 1–3. Mounted inside of the termination is a 47-ohm resistor which terminates the r-f cable between J403 and J201 in its approximate characteristic impedance, thus preventing radiation from this cable.

d. PHONES AND AUDIO OUTPUT.—The audio output circuit at the AUDIO receptacle (J402) on the rear of the equipment is designed to operate into a load impedance of 60 to 600 ohms, and to maintain its output voltage constant within 3 db over this impedance range. Audio output is also wired to a phone jack (J501) on the front panel. Any 600-ohm headphones fitted with a Navy type –49109, –49106B or –49034 plug can be connected into this jack.

e. CRYSTALS.—The equipment is designed for use with a type CR–24/U crystal in the crystal clip in the left-hand front panel compartment. This should be in place whether the equipment is operated with MANUAL or CRYSTAL controlled tuning. A type CR–23/U crystal, used in the second oscillator circuit, is mounted in a socket on the IF/AF chassis. Complete data on these crystal units are given in figures 7–26 and 7–27.

5. REFERENCE DATA.

a. NOMENCLATURE.—Receiving Set, Radio AN/URR–35.

b. CONTRACT NUMBER AND DATE.—NObsr–57142, 14 January 1952.

c. CONTRACTOR.—Federal Telephone and Radio Corporation, 100 Kingsland Road, Clifton, N. J.

d. COGNIZANT NAVAL INSPECTOR.—Assistant Inspector of Naval Material, 167 Prospect Street, Passaic, N. J.

e. NUMBER OF BOXES.—Two.

f. CUBICAL CONTENTS.—See tables 1–1 and 1–3.

g. WEIGHT.—See tables 1–1 and 1–3.

h. FREQUENCY RANGE.—225 to 400 mc nominal, 222.75 to 404.0 mc maximum.

i. TUNING BANDS.—One, continuous.

j. NUMBER OF PRESET FREQUENCIES.

(1) MANUAL TUNING.—None.

(2) CRYSTAL TUNING.—One, as determined by crystal unit installed.

k. TYPE OF FREQUENCY CONTROL.—Crystal-controlled oscillator, used only in CRYSTAL tuning operation.

l. TYPE OF RECEIVER.—Double superheterodyne.

m. INTERMEDIATE FREQUENCIES. — 18.6 and 1.775 mc.

n. RECEIVER OUTPUTS.

(1) AUDIO CHANNEL OUTPUT. — 60 milliwatts maximum into a 600-ohm load, with 7 percent maximum distortion.

TABLE 1–1. EQUIPMENT SUPPLIED

QUANTITY PER EQUIPMENT	NAME OF UNIT	NAVY TYPE DESIGNATION	OVER-ALL DIMENSIONS*			VOLUME*	WEIGHT*
			HEIGHT	WIDTH	DEPTH		
1	Radio Receiver	R–482/URR–35	8–7/16	17–1/2	19–1/8	2824	57
1 Set	Connector plugs	(See table 3–1)					4 oz.
1 Pair	Relay-rack mounting brackets		7	1–1/8	12		1 lb. 5 oz.
1	Radio Frequency Cable Assembly	CG–839/U (4′2″)	1	50	1	50	4 oz.
1	Electrical Power Cable Assembly	CX–1869/U (4′4″)	1–1/2	52	1–3/4	136	13 oz.
2	Instruction books	NAVSHIPS 91906	11	8–1/2	1/2	68	1–1/4
1	Maintenance Parts Kit		6–1/8	19	10	1164	15

* Unless otherwise stated, dimensions are expressed in inches, volumes in cubic inches and weights in pounds.

TABLE 1–2. EQUIPMENT REQUIRED BUT NOT SUPPLIED

QUANTITY PER EQUIPMENT	NAME OF UNIT	NAVY TYPE DESIGNATION	REQUIRED USE	REQUIRED CHARACTERISTICS
1	Antenna	AT–150/SRC or AS–390/SRC (see applicable installation drawing)	Signal pickup	1/4-wave, broad band; to cover 225–400 mc frequency range; 50-ohm terminal impedance
As required	Antenna transmission line	RG–10/U (see applicable installation drawing)	Antenna-to-receiver connection	Coaxial 50-ohm surge impedance
1 Each channel	Crystal unit	CR–24/U	Crystal control of tuning	Crystal freq. = $\frac{\text{(Channel freq.} + 18.6)\text{ mc}}{12}$
As required	Power cable	MCOS–2	Power input from 50–60 cps, 105–125 v source	2 wires; #18 or larger
As required	Audio output cable	TTHFWA–1	Audio-output connection to interphone or other audio responsive device	Twisted shielded pair
1	Headphones, with cord and plug (Navy Type –49034, –49106–B or –49109)	–49016	Listening	600 ohms impedance
As required	Scan-channel output cable (if panoramic tuning indicator is used)	RG–58/U	Connection to panoramic tuning indicator	Coaxial 50-ohm surge impedance

(2) PHONE JACK OUTPUT. — Same as (1), above.

(3) SCAN CHANNEL OUTPUT.—10 microvolts minimum across a 50-ohm load, for maximum signal input of 75 microvolts.

o. TYPE OF RECEPTION.—Amplitude-modulated voice or MCW.

p. CRYSTALS.

(1) Type CR-23/U, 16.8250 mc.

(2) Type CR-24/U, 20.3000 to 34.8833 mc to cover tuning range of 225 to 400 mc.

q. FREQUENCY STABILITY.—Over-all stability of receiver for any selected frequency when operated between 103.5 and 126.5 volts ac (using 115-volt transformer tap), between −20°C (−4°F) and +50°C +122°F), and between 30 percent and 90 percent humidity:

	CRYSTAL Operation	MANUAL Operation
For voltage variation	Negligible	±0.02%
For temperature variation	±0.008%	±0.1%

r. SILENCER CIRCUIT CHARACTERISTICS.

(1) EFFECTIVE SILENCING RANGE.—Up to maximum of 300 microvolts input.

(2) AUDIO OUTPUT REDUCTION.—Up to 40 db under standard output conditions.

(3) TIME-CONSTANT.—Less than 0.2 second.

s. IMPEDANCES.

(1) ANTENNA INPUT.—50 ohms, coaxial.

(2) AUDIO CHANNEL OUTPUT. — 600 ohms nominal.

(3) PHONE JACK OUTPUT.—600 ohms nominal.

(4) SCAN CHANNEL OUTPUT. — 50 ohms, coaxial.

t. ANTENNA SYSTEM.—None supplied by contractor; see table 1-2.

u. POWER REQUIREMENTS.

(1) VOLTAGE. — 105-125 volts, 50-60 cps ac, single phase.

(2) CURRENT. — 0.97 amp nominal, 1.04 amp maximum.

(3) POWER.—98 watts with blower off, 108 watts with blower on (at 115 volts, 60 cps).

v. SENSITIVITY.—8 microvolts, in series with 50 ohms, for 10-db signal-to-noise ratio (signal modulated 30 percent at 1000 cps).

w. SELECTIVITY.—70 to 85 kc down 6 db; less than 190 kc down 60 db.

TABLE 1-3. SHIPPING DATA

SHIPPING BOX NUMBER	CONTENTS		OVER-ALL DIMENSIONS*			VOLUME*	WEIGHT*
	NAME	DESIGNATION	HEIGHT	WIDTH	DEPTH		
1	Radio Receiver and accessories	R-482/URR-35	15-3/4	27-3/4	22-7/8	9998	125
2	Maintenance Parts Kit		7-1/2	22-5/8	11-3/4	1994	42

* Unless otherwise stated, dimensions are expressed in inches, volumes in cubic inches and weights in pounds.

TABLE 1-4. ELECTRON TUBE COMPLEMENT

UNIT	NUMBER OF TUBES OF TYPE INDICATED							
	OA2	OB2	6AK6	5654/ 6AK5W	5670	5726/ 6AL5W	5931	Total No. of Tubes
Preselector				6	3			9
IF/AF Section			1	5	2	2		10
Power Supply	1	1					1	3
Total Number of Each Type	1	1	1	11	5	2	1	22

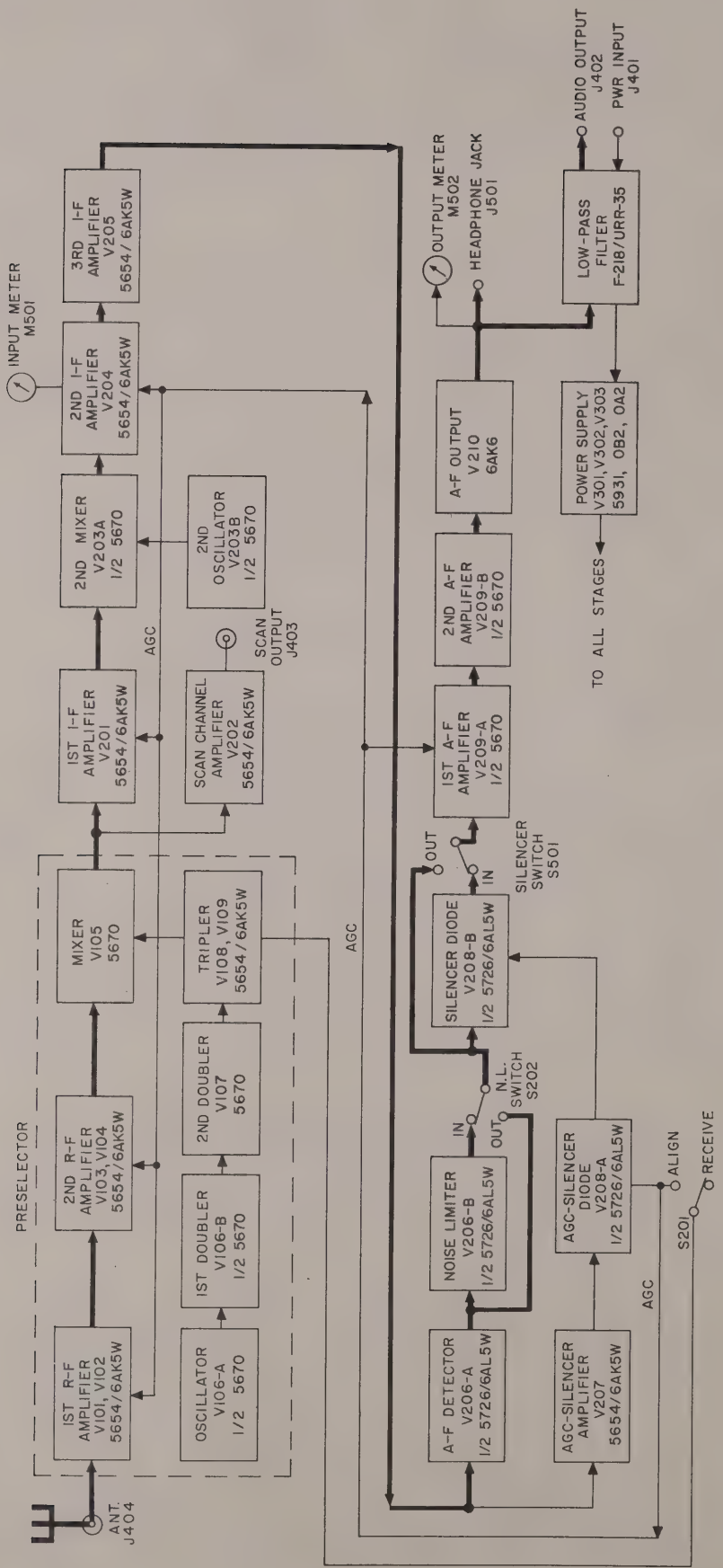


Figure 2–1. Radio Receiver R–482/URR–35, Block Diagram

SECTION 2
THEORY OF OPERATION

1. GENERAL PRINCIPLES.

Radio Receiver R–482/URR–35 is of the superheterodyne type, employing two frequency conversions and designed for either manual tuning or crystal-controlled operation over a frequency range of 225 to 400 megacycles. The receiver provides audio output to headphones or to an external speaker or intercommunication system. Output provisions are also included for an external panoramic (r-f sweep) adapter. A complete schematic diagram appears in figure 7–28.

As shown in the block diagram, figure 2–1, the receiver is basically conventional in most respects. Two stages of r-f amplification precede the mixer stage. The local injected signal is obtained from an oscillator followed by three stages of frequency multiplication. The oscillator functions as either a crystal-controlled or self-excited circuit, depending on the position of the OSC. switch. The five-gang capacitor which tunes the r-f and mixer stages is geared to the four-gang capacitor in the oscillator-multiplier section to provide single-control tuning. All stages in the receiver "front end" are part of a compact preselector subassembly.

The received signal is converted to an intermediate frequency of 18.6 mc in the mixer stage of the r-f amplifier section. This signal is then coupled to the first i-f amplifier and to the scan-channel amplifier, both in the IF/AF section. The output of the scan-channel amplifier is then applied to the 50 OHM SCAN jack at the rear of Low-Pass Filter F–218/URR–35, ready for use in a panoramic adapter, if one is to be used with the radio receiver. The output of the first i-f amplifier is applied to the second mixer, where the signal is mixed with the output of the crystal-controlled second oscillator. The i-f signal is converted to a frequency of 1.775 mc in the second mixer and then applied to the second i-f amplifier. This amplified signal is applied to the third i-f amplifier, which further amplifies the signal before it reaches the a-f detector and the AGC-silencer amplifier. The detected a-f signal is fed to the first audio amplifier via the noise limiter and the silencer diode. Each of these two stages may be disabled operationally, if so desired, by means of a front-panel control (N.L. and SILENCER switches, as applicable).

The signal from the first a-f amplifier is applied through the A.F. LEVEL potentiometer to the second a-f amplifier and then to the audio-output stage. The audio-output stage applies its signal through a transformer to the headphone jack, to the OUTPUT meter, and to the AUDIO connector. These outputs are connected in parallel from the secondary of the output transformer.

The silencer circuit and the AGC circuit are interrelated. As previously stated, the signal from the third i-f amplifier is applied both to the a-f detector diode and to the AGC-silencer amplifier. The i-f signal is further amplified by the AGC-silencer amplifier and then applied to the AGC-silencer diode. The rectified output of this stage is used both as AGC voltage and as the control voltage for the silencer diode. When no signal is being received, or a signal below a preset level is received, the silencer-diode cathode is biased to a value which cuts off the silencer diode. When the received signal is greater than this preset level, the output of the AGC-silencer diode reduces the bias to a level which will permit the silencer diode to conduct.

2. DETAILED CIRCUIT ANALYSIS.

a. PRESELECTOR. (*See figures 2–2 and 2–3.*)

(1) R-F AMPLIFIER SECTION.

(*a*) ANTENNA INPUT.—The antenna input circuit of Radio Receiver R–482/URR–35, having a nominal 50-ohm impedance, is to be used with coaxial transmission line. The transmission line connects to the 50 OHM ANT. receptacle (J404), located on the bottom of Low-Pass Filter F–218/URR–35 at the rear of the receiver.

A short piece of coaxial cable in the filter extends the antenna transmission line to connector J407, at the rear of the filter base plate (figure 3–3). This connector, in turn, plugs into coaxial receptacle P101, from which the antenna circuit extends to the tuned circuit composed of L101, C161, and L121; see figure 2–4. This circuit is inductively coupled to L102, in the input circuit of the first r-f stage.

Inductance L101 is an assembly consisting of an outer conductor of bent copper tubing, with an insulated inner conductor. Capacitor C161 serves to tune out the inductive reactances in the antenna input circuit.

(*b*) TUNING CAPACITOR ASSEMBLY.—The grid and plate circuits of the two r-f amplifier stages and the grid circuit of the mixer stage are arranged in push-pull, and are tuned by means of a balanced-type, five-gang capacitor.

Each section of this capacitor consists of a split-stator plate assembly and a rotor plate assembly mounted on a common metal shaft. The rotor of the capacitor is grounded to the chassis frame by means of wiping

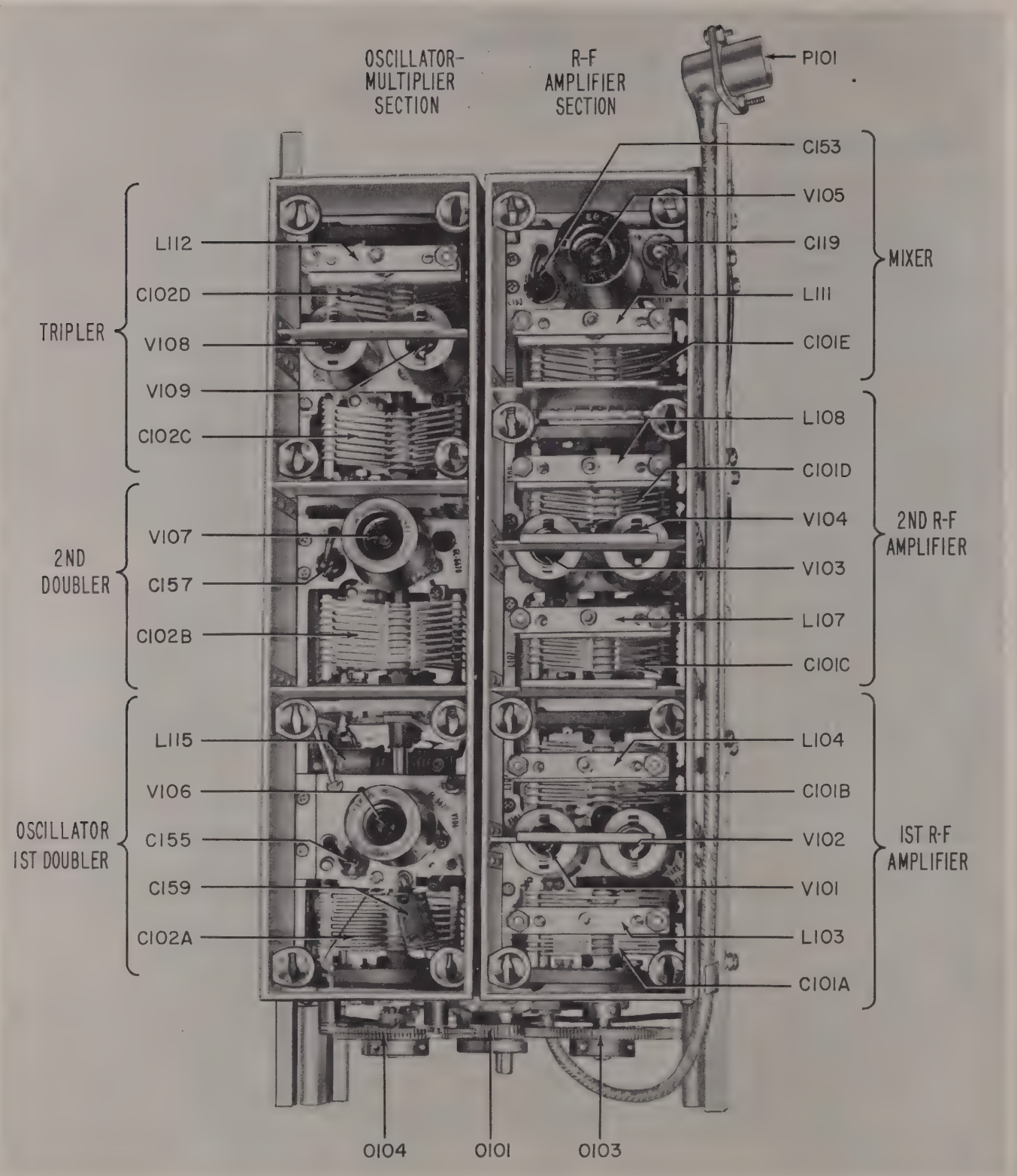


Figure 2–2. Preselector Viewed from Left Side of Unit, Shielding Covers Removed

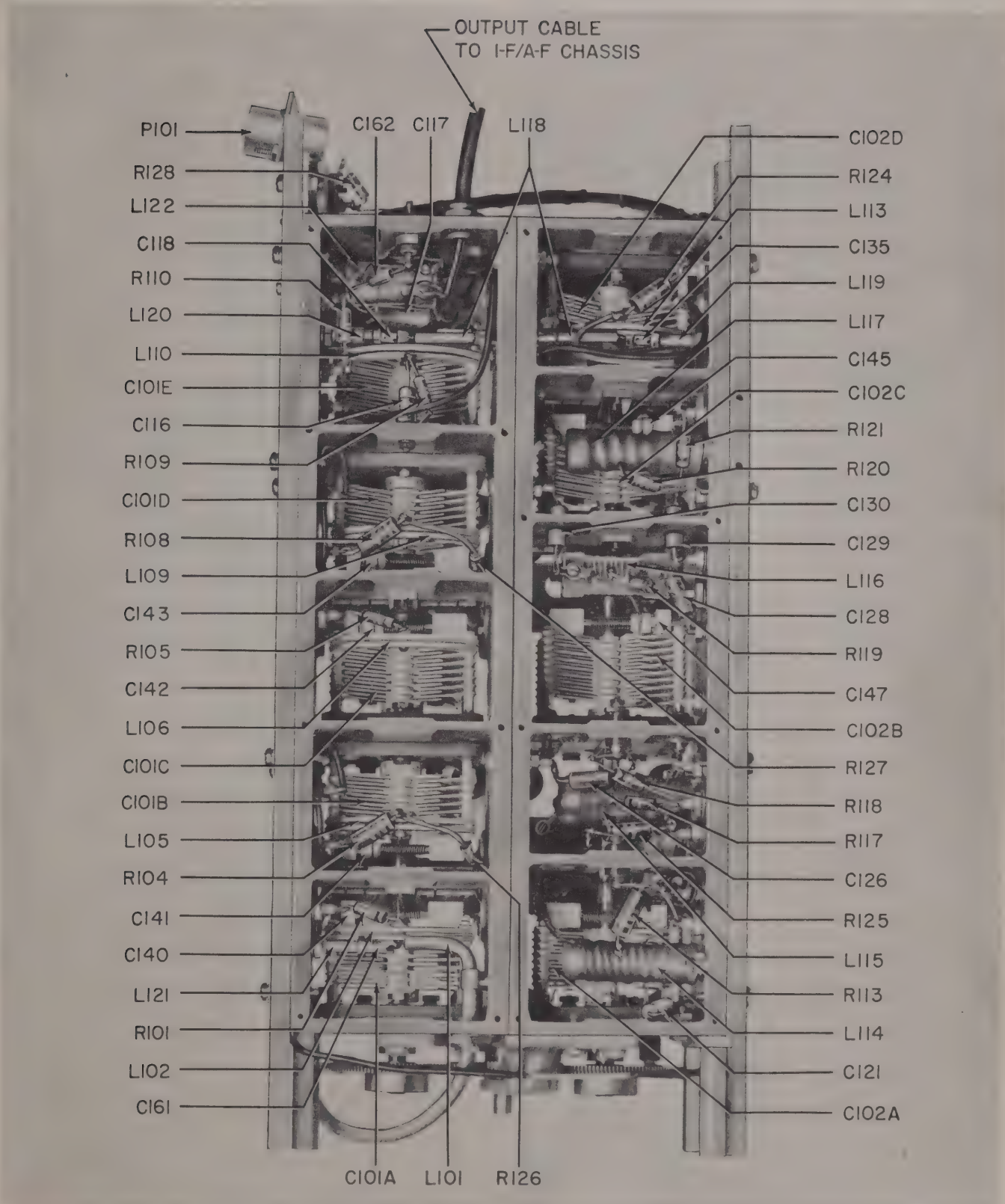


Figure 2–3. Preselector Viewed from Bottom of Unit, Shielding Covers Removed

contacts. The trimmer inductances (L103, L104, L107, L108 and L111), and the trimmer capacitors (C140 through C144) are integral parts of the stators and are connected across the split-stator plates. The tank-circuit inductors (L102, L105, L106, L109 and L110) are semicircular metal loops, and are also integral parts of the stators. The trimmer inductors (figure 7–9) each consist of two parallel, round rods connected by a shorting bar. Positioning of the shorting bar varies the inductance of each coil. The concentric-cylinder type trimmer capacitors each consists of a metal block mounted on one stator section, and a partially threaded rod which extends from a bracket on the other stator section into the center bore in the block. The block and rod constitute, respectively, the stator and rotor plates of the trimmer capacitor. The capacity of the trimmer is varied by turning the rod to adjust the amount of projection into the block. An insulating tube in the bore of the block serves as the dielectric.

(*c*) FIRST R-F AMPLIFIER.—As shown in the simplified schematic diagram, figure 2–4, the antenna circuit is coupled to the grid-input circuit of this stage. The grid circuit consists of tank inductance L102, trimmer inductance L103, section A of capacitor C101, and trimmer capacitor C140. Critical coupling is employed to maintain uniform sensitivity over the entire frequency range. Two type 5654/6AK5W tubes, V101 and V102, are operated in push-pull. The push-pull arrangement approximately halves the tube and circuit capacitance and inductance, permitting a greater range of frequency coverage and higher circuit efficiency. AGC voltage is applied to the grid circuit of this stage through decoupling resistor R101 and the center tap of coil L102. A feed-through type r-f bypass capacitor (C105) functions to bypass the AGC line at this point; this capacitor is located in the casting wall. Plate and screen voltages are brought through resistor R104; the supply is bypassed to ground at this point by capacitor C112. Resistors R102 and R103 are screen-voltage dropping resistors, while resistor R126 decouples the plate and screen circuits. The screen grids are bypassed to ground by the interelectrode capacitances of the tubes and by the stray capacitance of the socket and the socket wiring. Capacitors C103 and C104, in the cathode circuits, bring the cathodes closer to r-f ground potential by creating series-resonant circuits with the inductance of the cathode leads. The plate circuit is similar in design to the grid circuit and consists of tank inductance L105, section B of C101, trimmer inductance L104 and trimmer capacitor C141. Plate voltage is brought through resistor R104 to the center tap of coil L105. No appreciable inductive coupling exists between the plate circuit of the first r-f stage and the grid circuit of the second r-f stage because coils L105 and L106 are shielded from each other by the wall of the casting. Coupling between these two stages is accomplished by means of capacitors C108 and C109, which are connected from the plate circuit of the tubes in the first stage to the grid circuit of the tubes in the second stage.

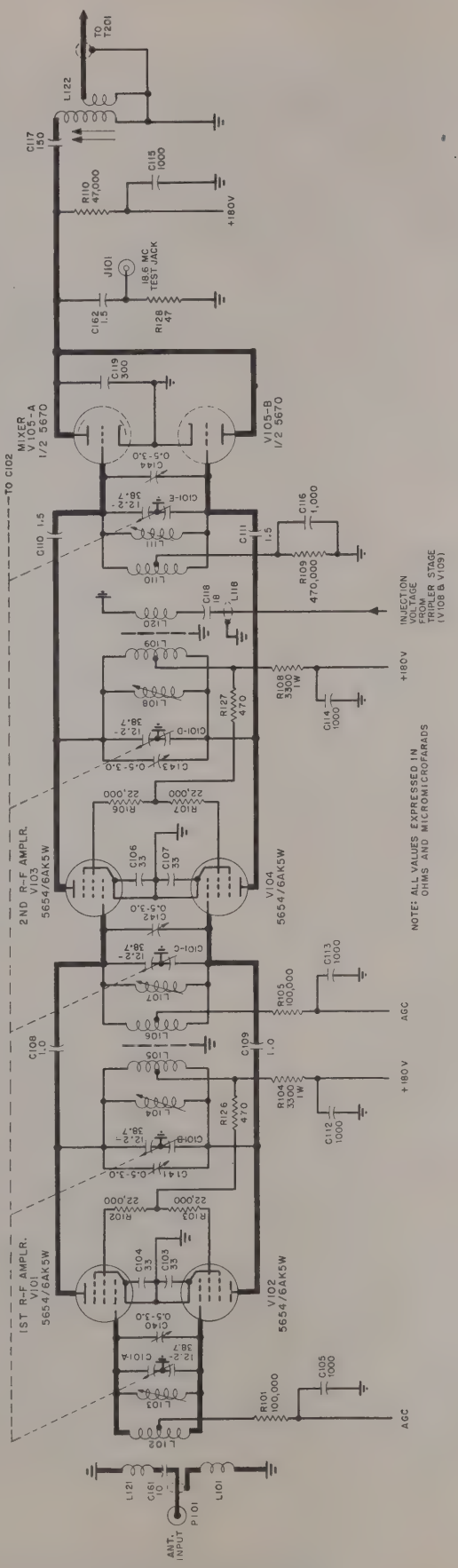


Figure 2–4. R-F Amplifier Section of Preselector, Simplified Schematic Diagram

(*d*) SECOND R-F AMPLIFIER. — This stage, employing tubes V103 and V104 in push-pull, is identical in design and in circuit constants to that of the first r-f stage; see figure 2–4. The tuned grid circuit consists of section C of capacitor C101, tank inductance L106, trimmer inductance L107 and trimmer capacitor C142. The plate circuit consists of section D of capacitor C101, tank inductance L109, and trimmers L108 and C143. AGC voltage is brought to the center tap of coil L106 through decoupling resistor R105; the AGC line is bypassed to ground by capacitor C113. Plate and screen voltages are brought through resistor R108; the supply is bypassed to ground at this point by capacitor C114. Resistors R106 and R107 are screen-voltage dropping resistors, while resistor R127 decouples the plate and screen circuits. The screen grids are bypassed by the interelectrode capacitances of the tubes and by the stray capacitance of the socket and socket wiring.

(*e*) MIXER.—The mixer, or first detector, stage employs a type 5670 dual triode, V105, in a push-push arrangement; see figure 2–4. The grids are connected in push-pull through the resonant circuit consisting of section E of capacitor C101, tank inductance L110, trimmer capacitor C144, and trimmer inductance L111. The plates of the two triodes are connected in parallel and are shunt-fed through resistor R110. Plate voltage is blocked from the grounded primary of L122 by capacitor C117. This capacitor and C119, connected in series, resonate with L122 at the intermediate frequency of 18.6 mc. The plates of V105 are connected to the junction of the two capacitors in order to provide impedance matching between the tube and the tuned circuit. With the push-push arrangement of the mixer, a high order of conversion gain is obtained because the push-push conversion transconductance is approximately twice that of a single converter tube.

The output of the second r-f stage is coupled to the grid circuit of the mixer stage by capacitors C111 and C110, while the output of the oscillator-multiplier circuit is inductively coupled to the grid circuit of the mixer through a coupling loop consisting of inductance L119 and capacitor C135 in the oscillator-multiplier unit (figure 2–5), and inductance L120 and capacitor C118 on the r-f converter (figure 2–4). L118 provides the inductive coupling between the oscillator-multiplier and the r-f amplifier. This coupling arrangement maintains a more uniform mixer-injection voltage over the frequency range of operation. The values of capacitors C118 and C135 are so chosen that, together with the shunt capacity of the short coaxial connecting line and the coupling coils, the loop is series resonant at a frequency (190 mc) below the low end of the band, and parallel resonant at a frequency (470 mc) above the high end of the band. Consequently, at the low-frequency end, the transfer voltage induced in the converter input tank is increased, while at the high end of the band the induced transfer voltage is reduced. If the coupling were not resonant, as described above, the induced voltage would tend to drop off at the low end and increase at the high end of the band, due to the change in Q of the oscillator-multiplier tank circuits.

The output of the mixer stage is link-coupled to the grid circuit of the first i-f stage. The type of coupling is made necessary by the physical layout of the equipment. The plate inductance (L122) of the mixer is contained in the mixer compartment of the r-f amplifier casting, while the i-f input transformer (T201) is located on the IF/AF chassis. A length of RG58/U coaxial cable joins the secondary winding of transformer L122 in the preselector and the primary winding of transformer T201 on the IF/AF chassis, thus establishing low-impedance inductive coupling between the two circuits. The 18.6-mc test jack, J101, has been provided so that test signals may be inserted, via C162, into the mixer output transformer. Resistor R126 serves to terminate the test signal generator.

Plate voltage is applied to the two plates of the tube through decoupling resistor R110. This resistor is bypassed to ground by capacitor C115. The grids of V105 are biased by the voltage developed across grid-leak resistor R109, which is bypassed by capacitor C116. This biasing network is connected to the grids through the center tap of inductance L110.

(2) OSCILLATOR - MULTIPLIER SECTION. — The oscillator-multiplier section generates a local injection signal 18.6 mc higher in frequency than the received signal. The basic oscillator frequency is generated in triode V106–A and is multiplied twelve times in the two doublers and one tripler which follow, as shown in the simplified schematic diagram, figure 2–5. When the OSC. switch, S203, is in the MANUAL position, the range of the oscillator is from 20.2063 to 35.05 mc, and the frequency at the plate of the tripler may range from 242.475 to 420.6 mc, allowing the radio receiver to operate over a frequency range of from 223.875 to 402.0 mc. When switch S203 is in the CRYSTAL position, the radio receiver will operate at the frequency determined by the crystal unit, within the frequency range of 222.75 to 404.0 mc. Thus, crystal frequencies between 20.1125 and 35.2167 mc may be used.

Tuning of the various stages is accomplished by capacitor C102, which is a four-section capacitor, each section being of the split-stator type. The use of split-stator capacitors in the balanced tank circuits permits the use of a grounded rotor to reduce inter-sectional capacitance. Rotor grounding is accomplished by wiping contacts. Since no appreciable r-f currents flow through these contacts, the inherent noise associated with wiping contacts is not present. Capacitor C102 is geared to the five-section capacitor, C101, to provide single-control tuning of the receiver; see figures 2–2 and 2–3. The trimmer inductance of the tripler stage and the trimmer capacitors utilized in all the stages of the oscillator-multiplier section are integral parts of the tuning capacitor, similar to those described previously in subparagraph 2*a*(1)(*b*), this section.

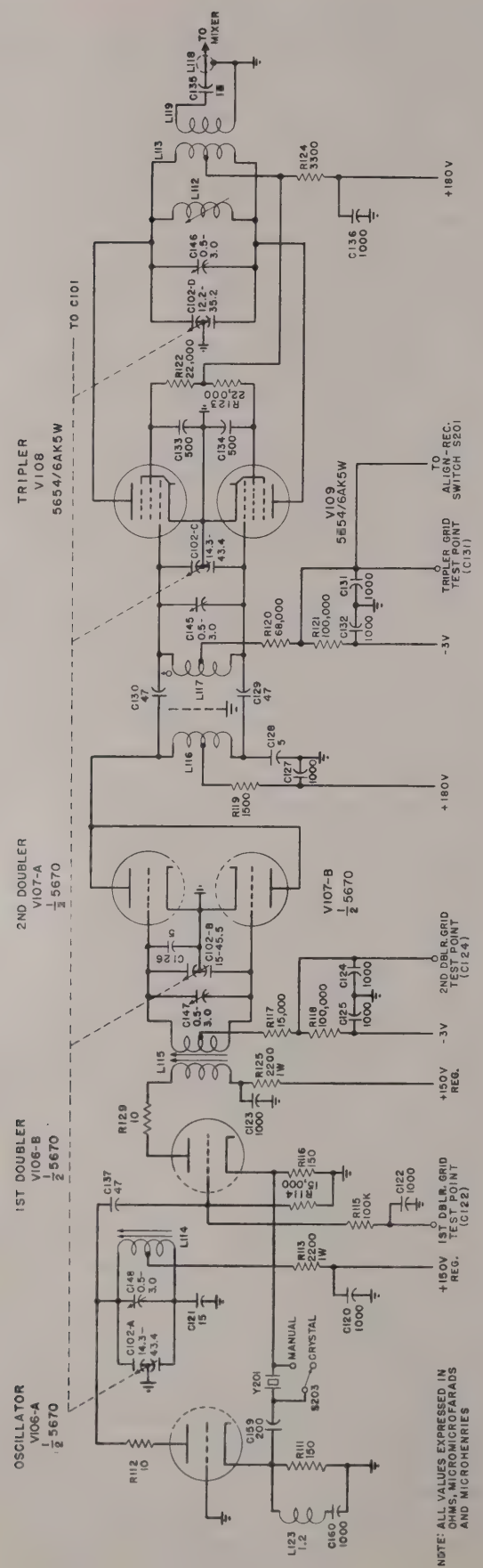


Figure 2–5. Oscillator-Multiplier Section of Preselector, Simplified Schematic Diagram

(*a*) OSCILLATOR-FIRST DOUBLER.—The oscillator and first doubler stages utilize a type 5670 dual triode; see figure 2–5. One half of the tube, V106–A, functions as a grounded-grid oscillator. The second half of the dual triode, V106–B, is arranged as a split-load cathode follower, and serves as both a frequency doubler and a source of feedback to the oscillator cathode.

To explain the operation of the oscillator, an equivalent but simplified circuit is illustrated in figure 2–6. L and C form a tank circuit in the plate circuit of V1; it is tuned to the resonant frequency of crystal Y1. Oscillations appearing at the plate of V1 are coupled to the grid of V2 through C1. V2 acts as a cathode follower, its output cathode voltage being in phase with the output from V1. Crystal Y1, oscillating in a series-resonant mode, transmits the voltage at the cathode of V2 to the cathode of V1. In turn, V1 acts as a grounded-grid amplifier and reinforces the oscillations at its plate. Thus, the positive feedback necessary to sustain oscillation is obtained, but only at the frequency at which the crystal is resonant.

If the crystal were shorted out, the positive feedback path from V2 to V1 would remain, but would no longer be frequency selective. Therefore, the frequency of oscillation would be determined by the resonant frequency of the L-C circuit at V1.

In the actual circuit (figure 2–5), V106–A and V106–B correspond, respectively, to V1 and V2. Y201 corresponds to Y1, while R111, R116 and C137 are equivalent to R1, R2 and C1, respectively. The oscillator tank circuit (L114, C102–A and C148) corresponds to the simplified components, L and C. The plate circuit of the first doubler, V106–B, is tuned to the second harmonic of the oscillator frequency. Therefore, the plate-circuit impedance at the oscillator frequency is very low, resulting effectively in grounded-plate (cathode follower) operation of V106–B at that frequency.

The oscillator functions as a crystal-controlled circuit when OSC. switch S203 is in the CRYSTAL position. The crystal, Y201, is a harmonic-mode type CR–24/U, which establishes the frequency of the feedback voltage from the cathode of V106–B to the cathode of V106–A. Capacitor C159, in series with the crystal, is utilized to resonate the inductance of the crystal leads so that zero phase shift exists between the two cathodes.

For manual tuning, the crystal is shorted out when switch S203 is in the MANUAL position. V106–A then functions as a free-running oscillator, the frequency of which is determined by the setting of tuning capacitor C102–A. Since the feedback path between the cathodes of the two triode sections is not frequency selective, the stability of the free-running oscillator is not as great as the crystal-controlled circuit.

On MANUAL tuning the receiver may be operated with or without a crystal in the crystal socket. However, since the original factory adjustment of the

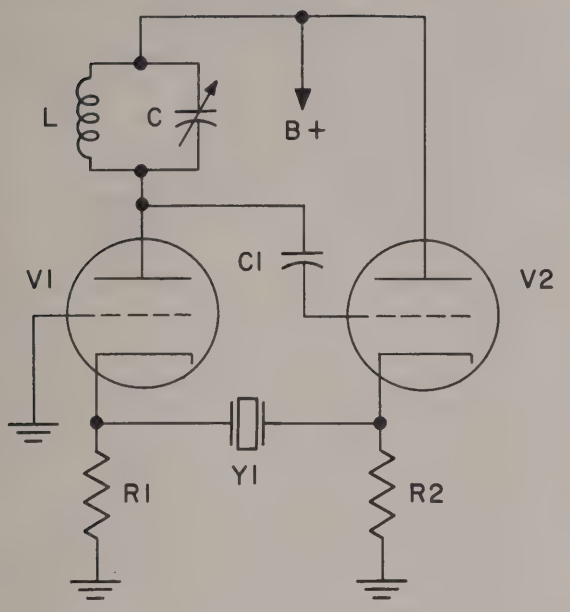


Figure 2–6. Oscillator, Simplified Equivalent Circuit

receiver was made with a crystal in the socket, it follows that dial calibration will be more accurate, and the reserve gain greater, if the receiver is operated in this same manner during MANUAL operation in the field. In the neighborhood of 400 megacycles, the resonant frequency of the receiver increases approximately 0.1 percent when the crystal is removed from the socket; near 225 megacycles, the corresponding increase is approximately 0.04 percent. This effect is attributable to the fact that there is some capacity between the crystal and ground, which also exists effectively between the cathodes of the oscillator tubes and ground. Removing the crystal from its socket removes this capacity and so causes a shift in the frequency of the oscillator.

The oscillator tank circuit consists of section A of variable capacitor C102, trimmer capacitor C148 and inductance L114. The tank circuit is kept balanced by the use of capacitor C121, which equalizes the output capacitance of V106–A. Resistor R112 tends to suppress spurious oscillation. Inductance L123 reduces the heater-to-cathode capacitive reactance so that the phase shift of the signal applied from the cathode of the first doubler tube to the oscillator cathode is as small as possible, while capacitor C160 prevents L123 from shorting the bias developed across resistor R111 to ground. Plate voltage is fed to the center tap of L114 through resistor R113 from a 150-volt regulated source; the B-plus line is bypassed for radio frequencies by capacitor C120.

The output of the oscillator stage is coupled to the grid of the first doubler through capacitor C137. Grid bias for V106–B is provided by the voltage drop across cathode resistor R116 and by the drop across grid-leak resistor R114. Plate voltage is applied through the untuned primary of bifilar-wound transformer L115; voltage is obtained from a 150-volt regulated source through decoupling resistor R125, which is bypassed for radio frequencies by capacitor C123.

The first-doubler cathode circuit is not bypassed, so that the r-f voltage dropped across resistor R116 may be fed back to cathode resistor R111. The values of R111 and R116 are such that the feedback is limited, but large enough to prevent oscillations which might occur, due to the capacitance across the crystal holder.

A test point is provided at the grid of the first doubler to measure the d-c bias on the tube. The measured voltage is indicative of the amount of drive from the oscillator. Resistor R115 and capacitor C122 decouple the grid circuit from the point of measurement.

(*b*) SECOND DOUBLER.—The second doubler stage employs the two sections of the type 5670 dual triode, V107, in a push-push circuit arrangement; see figure 2–5. The grid circuit is balanced and is tuned to the second harmonic of the oscillator frequency. The tuned circuit consists of the center-tapped secondary winding of transformer L115, section B of ganged capacitor C102 and trimmer capacitor C147. Capacitor C126 compensates for the capacitance unbalance to ground in the secondary winding of transformer L115.

The grids are returned through the center tap on the secondary of L115 and through resistors R117 and R118 to a —3-volt tap on the power supply. This bias voltage functions to prevent excessive rise in plate current if the driving voltage is removed. Capacitors C124 and C125 function to bypass r-f currents around this circuit. A test point, connected to the junction of resistors R117 and R118, provides means for measuring the second-doubler grid-leak bias, thus indicating the relative amount of drive from the first doubler.

The plates are tied in parallel, untuned inductance L116 constituting the plate load. This inductance is center-tapped to provide a balanced load for coupling to the grids of the tripler stage. Capacitor C128 at the ground side of L116 functions to balance the output capacitance of the second-doubler tubes at the opposite end of the inductance. Plate voltage is applied through decoupling resistor R119 to the center tap of L116. C127 functions as an r-f bypass capacitor. The output of the second doubler stage is coupled to the grid circuit of the tripler stage by means of capacitors C129 and C130. No appreciable inductive coupling exists between L116 and L117, since the two coils are isolated by the preselector casting.

The push-push circuit arrangement reduces the generation of odd harmonics. This eliminates the possibility of resultant spurious signals, which might otherwise be amplified and radiated by the receiver antenna.

(*c*) TRIPLER.—The tripler stage employs two type 5654/6AK5W pentodes, V108 and V109, in push-pull; see figure 2–5. The parallel-resonant grid circuit consists of inductance L117, section C of capacitor

C102 and trimmer C145, and is tuned to the fourth harmonic of the oscillator frequency. The center tap of L117 is returned through resistors R120 and R121 to the —3-volt grid-bias tap on the power supply. This bias voltage functions to prevent excessive plate current in the tube if the driving potential is removed. The bias circuit is bypassed for r-f to ground by means of capacitors C131 and C132. A tap at the junction of resistors R120 and R121 provides a metering point for checking the driving voltage applied to the grids of the tripler tubes, by measuring the grid-leak bias developed across resistor R120. The tap is also connected to the ALIGN position of switch S201 for alignment purposes, as explained in paragraph 2*f* of this section.

The plate circuit of the tripler stage is tuned to resonance at a frequency three times its grid input frequency, producing a total multiplication of 12, and resulting in an output frequency which is 18.6 mc higher than the received frequency. The tripler plate circuit is a parallel-resonant combination of inductances L112 and L113, and capacitors C102–D and C146. Plate and screen voltages are applied through resistor R124 to the center tap of L113 and the junction of screen voltage-dropping resistors R122 and R123, respectively. Capacitors C133, C134 and C136 bypass radio frequencies to ground, as required.

The output of the tripler stage is inductively coupled through inductance L119 and capacitor C135 in the oscillator-multiplier section of the preselector, and through capacitor C118 and inductance L120 on the r-f converter chassis, to the grid circuit of the mixer stage, as described in paragraph 2*a*(1)(*e*) of this section.

b. I-F AMPLIFIER AND CONVERTER STAGES. —The mixer output is link-coupled to the IF/AF chassis. The first stage on that chassis is tuned to the first intermediate frequency, 18.6 mc. This signal is converted to a frequency of 1.775 mc in the second mixer, and then applied to two more i-f amplifiers, at the same frequency. The third i-f amplifier is followed by the detector, noise limiter, silencer and AGC circuits, and then by two a-f amplifiers which precede the audio output stage. The overall i-f selectivity curve is shown in figure 7–7.

(1) FIRST INTERMEDIATE-FREQUENCY AMPLIFIER.—The i-f signal from the mixer stage of the r-f amplifier section is link-coupled into transformer T201. This transformer, tuned to resonance at 18.6 mc, feeds the grids of both the first i-f amplifier, V201, and the scan-channel amplifier, V202; see figure 2–7. The first i-f amplifier is a 5654/6AK5W pentode. AGC voltage is applied through resistor R201 and the transformer to the grid of the i-f amplifier. The AGC system is decoupled from the i-f signal by resistor R201 and capacitor C201–A. The plate and screen voltages for V201 are obtained from the +180-volt supply through the i-f gain control, R233. Screen voltage is supplied from this potentiometer through screen-voltage dropping resistor R205, and the screen is decoupled from the power supply by this resistor and capacitor C202–A, Plate voltage is supplied from potentiometer R233 through R206 and through i-f transformer T202. Capacitor C202–B and resistor R206 serve to decouple the power supply from the plate circuit. The output signal from the amplifier is applied to i-f transformer T202, a shielded, double-slug-tuned i-f transformer, which is tuned to resonance at 18.6 mc.

(2) SCAN-CHANNEL AMPLIFIER. — The scan-channel amplifier, V202, is a 5654/6AK5W pentode amplifier; see figure 2–7. The i-f signal is coupled from transformer T201 to the control grid of V202 through capacitor C203. Resistor R203, connected between the control grid of the scan-channel amplifier and ground, is the grid-leak resistor. Cathode bias is supplied by means of resistor R202 and capacitor C206–B. Plate and screen voltages are supplied to this stage through r-f chokes L201 and L206, and through resistor R204 from the +105-volt source. Capacitor C206–A serves as the screen-grid bypass. The plate-load resistor, R208, is tied between the plate and the screen grid, so that the output voltage is developed across resistor R208 only, not across both R208 and R204. Capacitor C247, along with r-f chokes L201 and L206, decouple the power supply from the signal in V202. The output of this stage is taken from load resistor R208, and applied through capacitor C204 to P201, a connector located in the rear apron of the receiver chassis. When not in use, the scan-channel output is terminated by a 47-ohm resistor located in terminating cap E401, at the rear of the low-pass filter.

(3) SECOND OSCILLATOR.—V203–B, one half of a type 5670 tube, is used as a crystal-controlled triode oscillator in order to create a heterodyning signal for the second of the two frequency conversion in this radio set; see figure 2–7. The crystal, Y202, is a type CR–23/U crystal, cut to have a nominal frequency of 16.8250 mc. Grid-leak bias is supplied for the oscillator tube by resistor R209, connected from the control grid to ground and in parallel with the oscillator crystal. Plate voltage for the stage is supplied from the +105-volt source to the plate by way of oscillator transformer T203. The output signal is applied to the mixer stage from a tap on the transformer coil. The oscillator may be tested by measuring the grid voltage developed across grid resistor R209 at test point J202. This test point is connected to the common connection of the grid, the grid-biasing resistor and the crystal, through resistor R210. Resistor R210 and capacitor C244 form a low-pass filter, which isolates the grid circuit from the meter used to measure the grid bias. The sine-wave signal applied to the grid by the oscillator crystal is amplified in the tube and applied to transformer T203. A portion of the signal is applied from a tap on the transformer winding (for impedance matching) to capacitor C208, and from this capacitor to the cathode of the mixer.

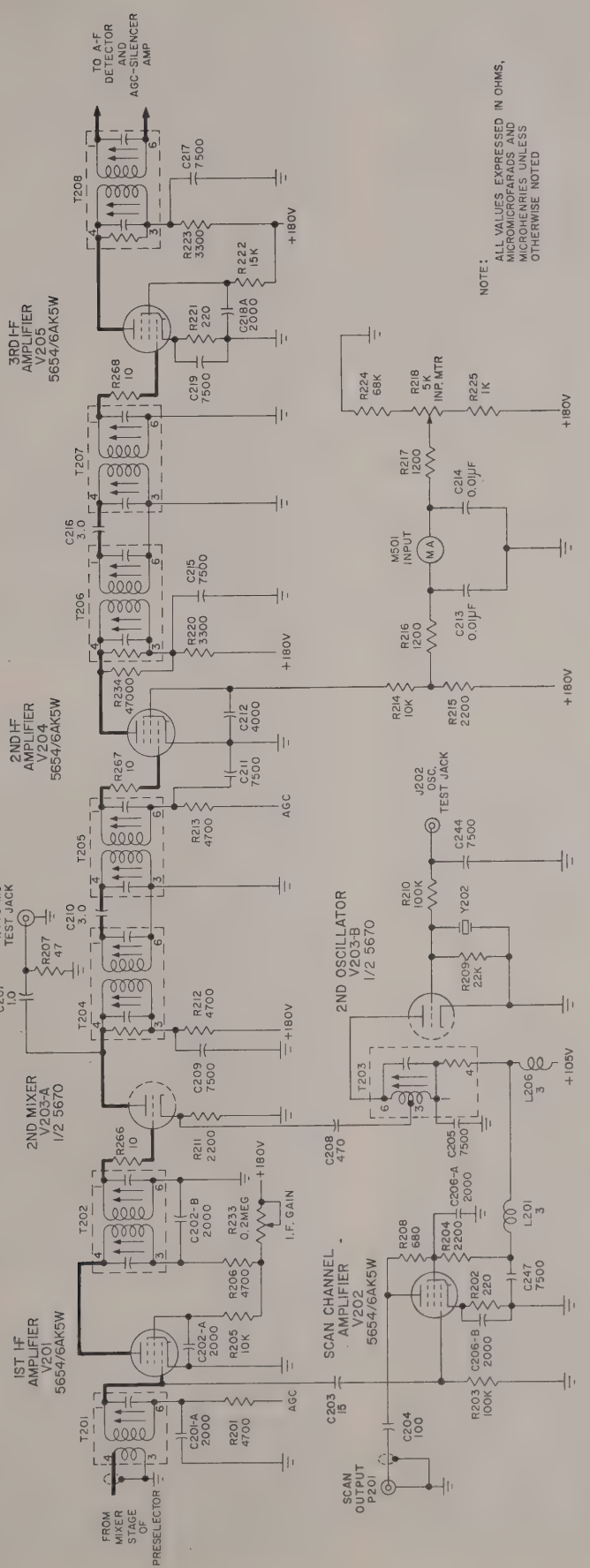


Figure 2-7. I-F Amplifiers, Scan-Channel Amplifier and INPUT Meter Circuit, Simplified Schematic Diagram

(4) SECOND MIXER. — The second mixer, V203–A, is one half of a 5670 twin-triode tube, as shown in figure 2–7. The i-f input signal is applied through the secondary winding of i-f transformer T202 to the control grid of the mixer, and the oscillator injection voltage is applied to the cathode. Resistor R266, in the grid circuit, tends to prevent spurious oscillation, while cathode resistor R211 serves as the point of oscillator injection. Plate voltage is supplied to this stage through resistor R212 and i-f transformer T204. Resistor R212 and capacitor C209 decouple the power supply from the i-f signal in transformer T204.

Mixing takes place inside the tube, as the i-f signal and the heterodyning signal are applied, respectively, to the control grid and cathode of the mixer stage. Both of these frequencies and the sum and difference frequencies are present in the plate circuit of the tube; however, the second i-f transformer, T204, is sharply tuned to resonance at the difference frequency of 1.775 mc, so that this frequency only is passed and all other frequencies are attenuated. The primary of the transformer, which is the plate load of the mixer, is loaded by a resistor. Capacitor C210 couples the signal from transformer T204 to transformer T205.

Test jack J201 is incorporated so that test signals may be applied, through capacitor C207, to the i-f circuits. Resistor R207 terminates the test signal generator in such cases.

(5) SECOND AND THIRD INTERMEDIATE-FREQUENCY AMPLIFIERS.—The components and circuitry of the second and third i-f amplifier stages are almost identical; see figure 2–7. The essential difference between the two i-f amplifier stages is that the gain of the second i-f amplifier stage is controlled by the AGC voltage, while the third i-f amplifier stage is self-biased.

Power is supplied to the type 5654/6AK5W second and third i-f amplifiers, V204 and V205, from the +180-volt source, through the i-f transformers to the plates. The screen grids also are supplied from the +180-volt source. The resistor (R267, R268) in the control-grid circuit of each stage prevents spurious oscillation.

The interstage coupling networks, consisting of T204 and T205 between the second mixer and the second i-f amplifier, and T206 and T207 between the second and third i-f amplifiers, function and are aligned as quadruple-tuned circuits. These two quadruple-tuned circuits help produce an i-f passband which is relatively flat at the top and yet retains the desired selectivity by virtue of its steep sides; see figure 7–7. Transformer T208, between the third i-f amplifier and the a-f detector, is a conventional double-tuned network. Each of the primary windings of the i-f transformers is decoupled from the power supply by R–C networks (R220–C215 and R223–C217); the secondary winding of T205 is decoupled from the AGC line by R213 and C211.

(6) "INPUT" METER CIRCUIT.—INPUT meter M501 is provided to indicate the approximate incoming signal strength. It also serves as an alignment indicator for the oscillator-multiplier section when switch S201 is placed in the ALIGN position. The meter circuit is shown in figure 2–7. One side of meter M501 is connected through a low-pass filter, consisting of R216 and C213, to the junction of resistors R214 and R215 in the screen-grid circuit of the second i-f amplifier, V204. The other side of the meter is connected through a similar filter (R217 and C214) to the wiper arm of INP. MTR. potentiometer R218. Potentiometer R218, along with resistors R224 and R225, is connected in a voltage-divider network between the +180-volt supply and ground.

With no signal present in the receiver, pentode V204 conducts heavily, causing a voltage drop across resistor R215. The INP. MTR. control, R218, is then adjusted so that the wiper-arm potential is equal to the potential at the junction of R214 and R215. This results in equal potentials at each side of meter M501 and, consequently, no meter indication. When a signal is received, the developed AGC voltage increases the bias on V204, and the reduction in screen current decreases the voltage drop across resistor R215. Since a voltage difference then exists across the meter terminals, an indication is obtained on the meter.

The INPUT meter functions in the same manner when used for alignment purposes. However, the AGC voltage is replaced by the tripler grid-leak bias, as explained in detail in paragraph 2*f*, this section.

c. AUDIO-FREQUENCY DETECTOR.—The audio-frequency detector, V206–A, is one half of a type 5726/6AL5W twin diode; see figure 2–8. The i-f signal from terminal 1 of transformer T208 is applied to the diode plate. Resistors R226, R227 and R229, connected between the diode cathode and terminal 6 of T208, constitute the diode load. These resistors are bypassed for radio frequencies by capacitors C220, C221 and C222. The audio-frequency output, obtained from the junction of resistors R226 and R227, is applied through the noise-limiter diode and the silencer diode (either or both of which can be disabled—the noise limiter mechanically and the silencer electrically) to the grid of the first a-f amplifier.

The detector output can be checked at jack J203, the detector test point. This jack is connected to terminal 6 of i-f transformer T208 through isolation resistor R262.

d. NOISE LIMITER.—Diode V206–B, one half of a 5726/6AL5W twin diode, functions as a series-valve noise limiter and is connected between the a-f detector and the silencer diode; see figure 2–8. The N.L. (noise limiter) switch, S202, enables the operator to cut the noise limiter in or out of the receiver circuit, as determined by operating conditions. When S202 is in the OUT position, the audio signal obtained at the junction of resistors R226 and R227 is applied directly to the

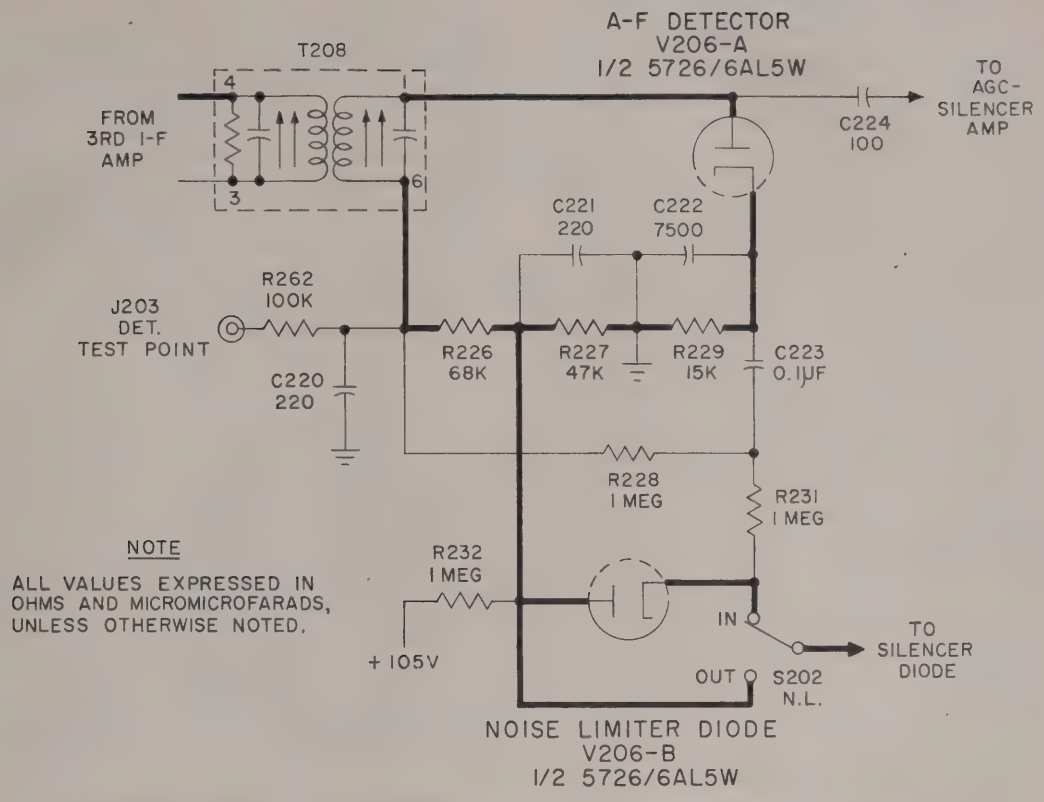


Figure 2–8. A-F Detector and Noise Limiter Circuits, Simplified Schematic Diagram

silencer circuit; noise-limiter diode V206–B has no effect on the signal. However, when S202 is placed in the IN position, the noise limiter functions as follows:

The negative voltage, developed across detector load resistors R226 and R227, is applied through resistor R228 to capacitor C223, building up on this capacitor a negative potential approximately equal to the total average rectified d-c voltage between terminal 6 of T208 and ground. The audio-frequency component of the rectified voltage is taken from the detector diode circuit at the junction of resistors R226 and R227. The audio-frequency path is then from plate to cathode of V206–B, and across switch S202 to the silencer circuit. It will be noted that the cathode of V206–B is at the potential of terminal 6 of T208, which is more negative than the diode plate because of the voltage-divider action of R226 and R227. Since the diode cathode is at a negative potential with respect to the plate, current flows within the tube and an a-f path is established.

In the event that a sharp pulse of noise is received, the long time-constant of R228 and C223 does not permit capacitor C223 to charge to the high transient voltage. However, the voltage at the junction of R226 and R227 rapidly follows the change, placing the plate of V206–B at a more negative potential than the cathode, thereby cutting off the diode for the duration of the noise pulse. Consequently, the noise pulse does not reach the a-f circuit (via the silencer diode). Resistor R229, in the load circuit of the a-f detector, acts as an accelerating circuit to bring the noise-limiter diode to the condition of non-conduction more quickly, when a noise pulse enters the receiver. A positive pulse from the cathode end of R229 is coupled to the diode cathode through capacitor C223 and resistor R231. This positive voltage aids the negative voltage at the plate in cutting off the diode for the duration of the noise pulse.

Resistors R232 and R227 form a voltage divider across the 105-volt regulated supply. Since the plate of V206–B is tied to the junction of these resistors, it is biased by approximately +4.7 volts. This positive bias determines the operating point of the diode such that the forward (conducting) resistance is sufficiently low to cause less than a 3-db insertion loss.

e. AGC-SILENCER AMPLIFIER. — The AGC-silencer amplifier, shown in figure 2–9, amplifies the output from the i-f amplifiers to a level which is suitable for use in the AGC and silencer circuits. The i-f signal from terminal 1 of transformer T208 is coupled through capacitor C224 to the control grid of V207, a 5654/6AK5W pentode amplifier. The grid is biased from the —9-volt source in the power supply, through resistor R230. The screen grid is supplied from the +150-volt source in the power supply, and is decoupled from the power supply by resistor R239 and capacitor C225. Plate voltage is supplied from the +180-volt source, through transformer T210. T210 comprises a parallel-resonant circuit at the second

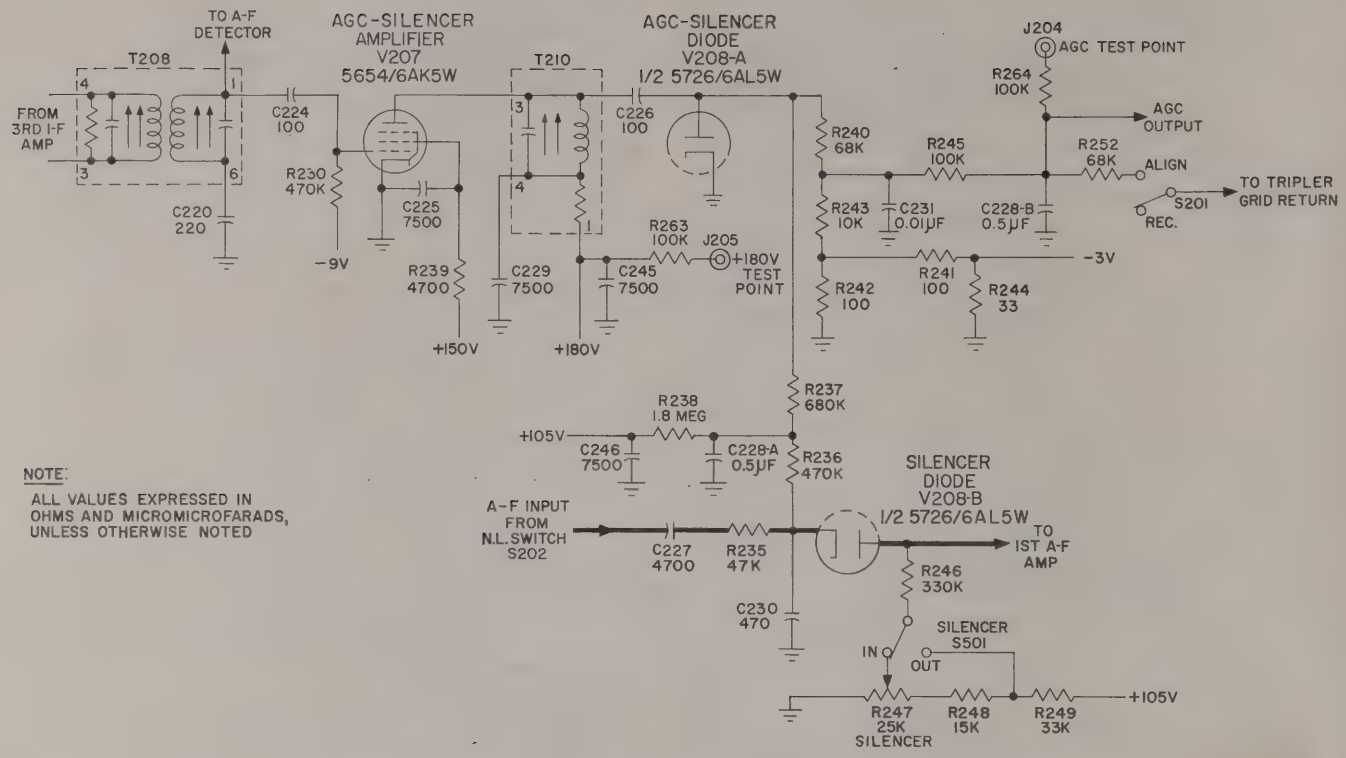


Figure 2–9. AGC and Silencer Circuits, Simplified Schematic Diagram

intermediate frequency, 1.775 mc, and serves as the plate load for V207. The amplified signal from this stage is coupled, via capacitor C226, to AGC-silencer diode V208–A.

The AGC-silencer amplifier is decoupled from the power supply by a resistor in transformer T210 and by capacitors C229 and C245. A B+ test point, J205, is connected to the power supply through resistor R263.

f. AGC-SILENCER DIODE. — The AGC-silencer diode, V208–A, is a shunt rectifier which provides the required d-c voltages for the AGC and silencer circuits. As shown in figure 2–9, one half of a 5726/6AL5W twin diode is utilized in the circuit. When switch S201 is in the REC. position, the diode load consists of resistors R240 and R243 in series with the series-parallel network of R242, R241 and R244. The junction of resistors R241 and R244 is connected to the —3-volt bias source, so that the plate of V208–A is biased at approximately —1.8 volts. When the peak value of the 1.775-mc signal, coupled to the diode plate from V207, exceeds this delay bias, the diode conducts and a negative rectified voltage is developed across the load resistors. The voltage which is obtained at the junction of R240 and R243 is the AGC voltage; this voltage is bypassed for radio frequencies by C231 and is fed to the AGC line through a low-pass filter, R245 and C228–B, which removes the audio-frequency components from the voltage. AGC voltage is applied to the first and second r-f amplifiers, first and second i-f amplifiers, and first a-f amplier. R-C decoupling networks are incorporated in the grid circuits of each of the controlled r-f and i-f amplifiers. Regardless of whether or not AGC voltage is developed from a received signal, a minimum bias of —1.8 volts is present at each of the controlled stages because of the connection of the diode load circuit to the —3-volt bias source. AGC voltage may be checked at jack J204, which is connected to the AGC line through isolating resistor R264.

The negative d-c voltage which is developed at the plate of V208–A is utilized as the control voltage for silencer diode V208–B. This circuit is explained in paragraph 2*g* of this section.

The AGC circuit also provides means for indicating the alignment of the oscillator-multiplier section of the receiver. When switch S201 is placed in the ALIGN position, the grid-leak bias developed across resistor R121 in the tripler grid circuit is applied to the AGC line through resistor R252. As the tank circuits of the oscillator, first and second doublers, and tripler grid circuit are tuned to resonance, the tripler grid-leak bias increases and places a negative voltage on the AGC line. This results in a reading on INPUT meter M501, as explained in paragraph 2*b*(6) of this section. The greater the meter deflection, the greater the drive and bias at the tripler grid. Hence, an indication of alignment is obtained for the oscillator and first doubler stages.

g. SILENCER.—The noise silencer (squelch) circuit is used to prevent noise from reaching the audio section of the receiver in the absence of an incoming signal of some predetermined minimum level. Silencer diode V208–B, connected between N.L. switch S202 and first a-f amplifier V209–A, permits the audio signal to pass during conduction and cuts off the audio signal when it is not conducting. V208–B is one half of a type 5726/6AL5W dual diode; see figure 2–9. The silencer may be cut in or out of the receiver circuit by means of SILENCER switch S501. SILENCER potentiometer R247 is used to adjust the silencing threshold.

Both the plate and cathode of silencer diode V208–B are biased. The plate is biased from a point on the voltage divider, formed by R247, R248 and R249, connected between the +105-volt source and ground; the cathode is biased by the voltage which appears at the junction of resistors R237 and R238, connected between the +105-volt source and the plate of AGC-silencer diode V208–A. Audio-frequency components of the voltage from V208–A are filtered out by R237 and C228–A. Capacitor C230, in conjunction with R235 and R236, filters high-frequency audio components from the voltages applied to the silencer diode. Capacitor C246 bypasses the +105-volt source.

In normal operation, with no received signal, the cathode of the silencer diode is held at about +30 volts by the voltage applied to it through resistor R236 from the junction of resistors R238 and R237. When SILENCER switch S501 is in the OUT position, the diode plate is biased at approximately +58 volts, being connected to the junction of resistors R248 and R249 through R246. Since the plate of the silencer diode is much more positive than the cathode, the diode conducts. Thus, any *signal* or *noise* present at the cathode is passed through the diode to the first audio stage and the silencer circuit is inoperative.

The silencer circuit is made operative by placing SILENCER switch S501 in the IN position. In this switch position, the plate of V208–B is connected through R246 to the wiper arm of SILENCER potentiometer R247, thereby lowering the positive bias on the plate. Potentiometer R247 permits adjustment of the plate voltage from zero to approximately +36 volts, so that the silencer diode may or may not conduct, depending on the setting of the potentiometer. With no received signal, R247 is set just beyond the point which cuts off the diode, thereby preventing noise from passing through to the first audio amplifier. When a signal which exceeds the noise level is received, a negative voltage is developed at the plate of AGC-silencer diode V208–A; refer to paragraph 2*f* of this section. This voltage, applied to the voltage-divider network (R237 and R238) in the cathode circuit of the silencer diode, reduces the positive bias at the cathode and permits the diode to conduct. Thus, the audio signal fed to the cathode from switch S202 is passed through the silencer diode to the audio amplifiers.

h. AUDIO-FREQUENCY STAGES. — The audio-frequency stages of the radio receiver, shown in figure 2–10, are conventional in most respects. The first and second a-f amplifiers, V209–A and V209–B, are the two halves of a type 5670 twin triode. The input signal is applied from the silencer diode through coupling capacitor C232 to the grid of V209–A. Bias is applied to the control grid from the AGC source through a voltage divider, R250 and R251. In the plate circuit, capacitor C235–A attenuates the unwanted higher frequencies, so that only the voice frequencies necessary to efficient communication legibility are amplified. The output of this amplifier is applied to a two-section high-pass filter which helps establish the lower limit of the 350- to 3500-cps audio passband. The filter is composed of capacitor C233, resistor R254, capacitor C234 and potentiometer R255. The signal is transferred through the wiper arm of the potentiometer, the A.F. LEVEL control, to the control grid of V209–B, the second a-f amplifier. Degenerative feedback is provided in this stage by the use of an unbypassed cathode resistor, R256, and by the feedback loop established from the secondary of output transformer T209, through resistor R261, to the unbypassed cathode resistor. The amplified output of the second a-f amplifier is applied to the grid of the a-f output stage, V210. This tube, a 6AK6 power pentode, delivers approximately 1.1 watts, with a total distortion of approximately 5 percent, to audio output transformer T209. Cathode resistor R259 is bypassed by capacitor C237–A. Capacitors C238 and C239, in the plate circuit of V210, set the high-frequency limit of the audio circuit at 3500 cycles per second, as does C235–B in the plate circuit of V209–B.

Audio signal from the a-f output stage is transmitted, via the electrostatically-shielded output transformer, T209, to the required output circuits. The impedance step-down of the transformer is 10,000 to 60, and the secondary provides balanced output. Signal from the secondary is fed via the r-f filter composed of L202, L203, C240 and C241 to OUTPUT meter M502. Similarly, it is fed via the PHONES gain control, R502, and the associated r-f filter, L204, L205, C242 and C243, to headphones jack J501. A third circuit transmits audio output via connectors P301 and J405 for external use through the AUDIO output receptacle (J402), located at the rear of the cabinet. This line is also filtered against external r-f fields by a combination of inductances, L405, L406, L407 and L408 and capacitors, C405, C406, C407 and C408. This filter is a part of Low-Pass Filter F–218/URR–35.

For headphone use, the front-panel PHONES volume control (R502) provides an audio-level adjustment auxiliary to the main A.F. LEVEL control (R255).

i. POWER SUPPLY.—A single power transformer, T301, supplies heater or filament power for all tubes and, after rectification, high d-c voltages for plates and screens, as well as small negative voltages used for bias. See the simplified schematic diagram, figure 2–11.

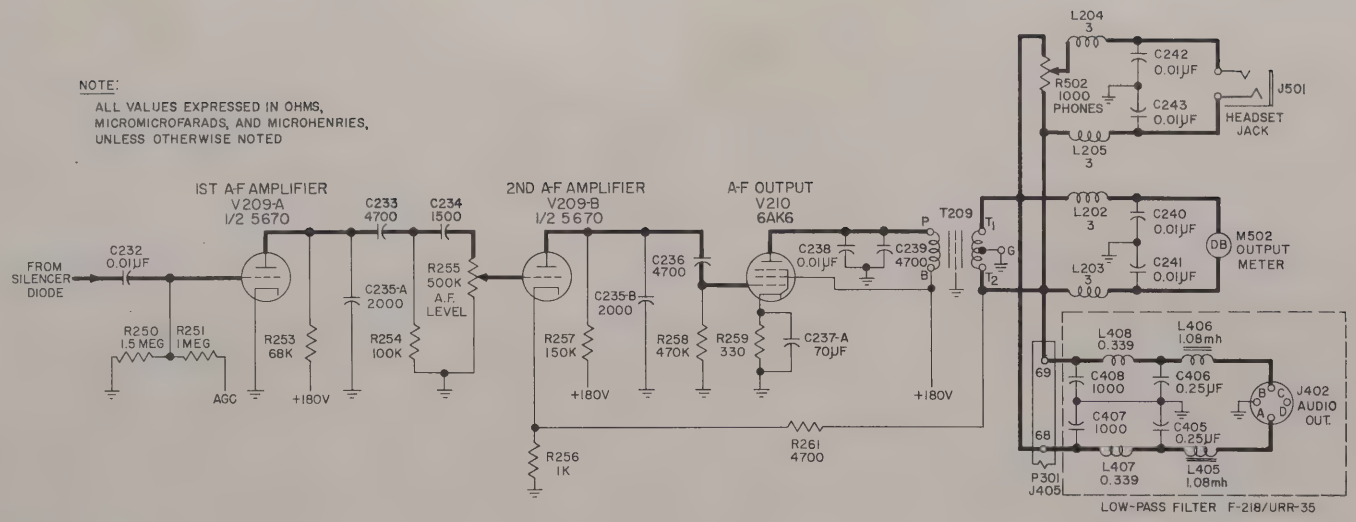


Figure 2–10. Audio-Amplifier Stages, Simplified Schematic Diagram

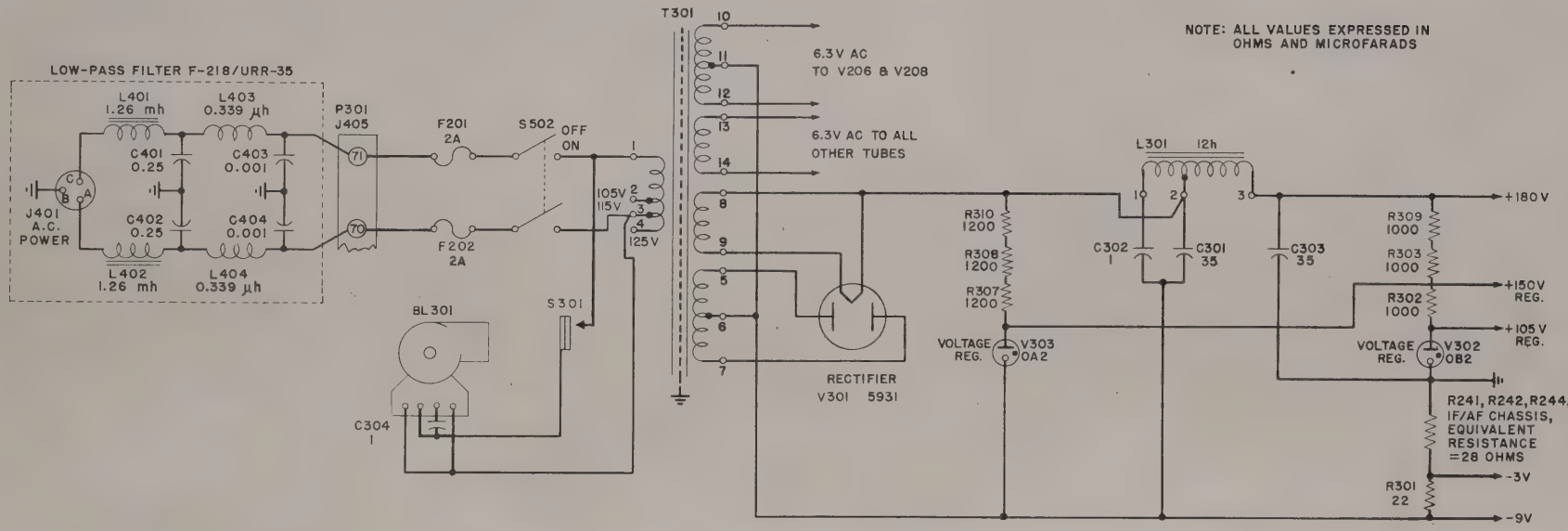


Figure 2–11. Power Supply, Simplified Schematic Diagram

(1) FILAMENT AND HEATER SUPPLY.—Of the four secondary windings of transformer T301, three are for filament or heater power. One provides filament power at 5 volts for the type 5931 rectifier (V301); a second supplies 6.3 volts for the detector, noise limiter, AGC silencer, and silencer diodes (V206 and V208); and a third provides 6.3 volts for all other tube heaters. The center-tap of the diode-heater secondary is connected to a 9-volt negative potential instead of to ground. This bias on the heaters minimizes hum.

(2) PLATE AND SCREEN SUPPLY.—The type 5931 rectifier, V301, provides full-wave rectification of the high-voltage from the fourth transformer secondary. The rectified voltages are supplied at +180 volts and +105 volts for plates and screens. A separate and regulated +150-volt output is provided for use on the local oscillator and first doubler stages of the preselector, and the AGC-silencer amplifier. Filtering is accomplished by capacitors C301, C302 and C303, and reactor L301. The inductance of the coil between terminals 1 and 2 is such that it is series-resonant at the ripple frequency in conjunction with capacitor C302, and thus provides a low-impedance path for ripple currents; hum is therefore minimized. Input filter capacitor C301 and output filter capacitor C303 are used in the conventional manner. A type OA2 gaseous regulator tube, V303, is used with the required series resistance (R307, R308 and R310) to regulate the 150-volt supply. The type OB2 regulator, V302, operates with its series resistance (R302, R303 and R309) to regulate +105-volt supply. Plate voltage (+180 volts) is sufficiently stable without regulation.

(3) BIAS VOLTAGE.—Bias voltages are obtained by operating the negative side of the rectifier below ground potential. This output is derived from return current through R301, R241, R242 and R244 to provide a —9-volt potential for biasing the grid of the AGC-silencer amplifier and a —3-volt potential for use in the AGC circuits and as bias for the grids of the doubler and the tripler stages in the oscillator-multiplier section. The full 9-volt negative potential is applied to the heaters of diodes V206 and V208 to minimize hum.

(4) PRIMARY CIRCUIT.—The primary of power transformer T301 is tapped for operation from a 105-, 115- or 125-volt, 50/60-cps, single-phase a-c line. The power supply (and therefore the receiver) is turned on or off by the front-panel POWER switch, S502, which opens both sides of the input power line. Circuit protection is provided by the two fuses, F201 and F202, which are in fuse holders mounted inside the right-hand, front-panel compartment. Line power is brought to the power supply via connectors P301 and J405 from Low-Pass Filter F–218/URR–35 and A.C. Power input receptacle J401 at the rear of the receiver. The circuit is filtered against external r-f fields by the two-section filter composed of inductances L401, L402, L403 and L404, and capacitors C401, C402, C403 and C404. The entire filter is contained in the low-pass filter assembly.

(5) BLOWER AND THERMOSTAT. — Blower BL301 is mounted in the power supply section and is used to keep the operating temperature inside the receiver within satisfactory limits. It is controlled by thermostat S301, which automatically applies voltage to the blower whenever the inside ambient temperature reaches 49°C (120°F). Capacitor C304 provides the 90-degree phase shift necessary for the operation of the split-phase motor in BL301 from a single-phase line.

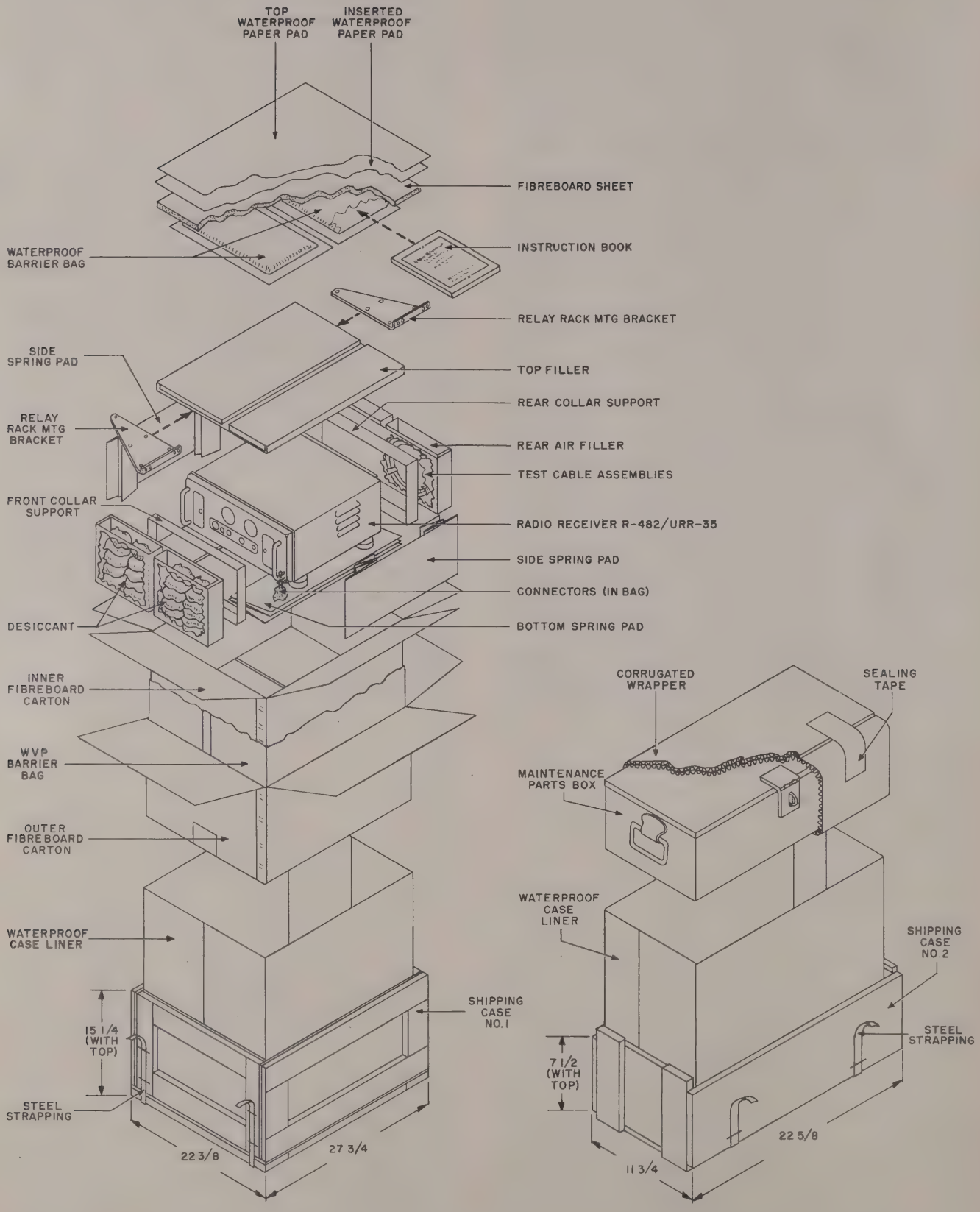


Figure 3–1. Packaging of Radio Receiving Set AN/URR–35

SECTION 3
INSTALLATION

1. UNPACKING THE EQUIPMENT.

a. GENERAL.—Each complete Radio Receiving Set AN/URR–35 is shipped in two wooden cases. Case No. 1 contains the receiver and its accessories, while the maintenance parts kit is packed in case No. 2. The accessories which are packed in case No. 1 with the receiver are the two test cable assemblies, the set of four connector plugs, the pair of relay-rack mounting brackets and two instruction books; see figure 1–1. The method of packing the equipment is shown in figure 3–1; refer to that illustration while unpacking in accordance with the instructions outlined in the following subparagraphs.

b. UNPACKING RADIO RECEIVER R–482/URR–35 AND ACCESSORIES.

(1) Set up the shipping case as indicated by the markings on the outside and cut the steel strapping.

(2) Using a nail puller, remove the top of the case.

CAUTION

Do not use a pinch bar or claw hammer to remove nails.

(3) Open the waterproof case liner by cutting through the top and inserted waterproof paper pads.

(4) Remove the fibreboard sheet and take out the instruction books which are sealed in waterproof barrier bags.

(5) Open the outer fibreboard carton. Cut the moisture-vaporproof barrier bag between the outer and inner cartons, and open the inner fibreboard carton.

(6) Remove the top filler and take out the relay-rack mounting brackets from its recesses.

(7) Remove the test cable assemblies from the recesses of the rear air filler and store them in the place designated by the Officer-in-Charge.

(8) Remove the bags of desiccant from the recesses of the front air filler.

(9) Take out the front and rear air fillers, the two side spring pads, and the front and rear collar supports.

(10) Lift out the receiver. The bag containing the four connector plugs is tied to the right handle on the front panel of the receiver.

c. UNPACKING MAINTENANCE PARTS KIT.

(1) Perform steps (1) and (2) of preceding paragraph 1*b*.

(2) Cut open the waterproof case liner.

(3) Cut the sealing tape and open the corrugated wrapper.

(4) Lift out the maintenance parts box and store it in the place designated by the Officer-in-Charge.

2. PREPARATION FOR USE.

a. REMOVAL OF CHASSIS.—The chassis should be removed from the cabinet, prior to using the equipment, in order to inspect the receiver, reinstall rectifier V301, and check the power transformer connections. To remove the chassis from the cabinet, loosen the four fasteners in the extreme corners of the front panel by giving each a quarter-turn to the left. Pull the chassis forward until the spring-actuated stops on the bottoms of the side rails prevent further travel; then release these stops (one on each side) by pressing them upward and pull the chassis completely out of the cabinet; see figure 3–2.

b. REINSTALLATION OF RECTIFIER TUBE.—The only part removed from its normal location for shipment is V301, the type 5931 rectifier tube. This

Figure 3–2. Removing Chassis from Cabinet

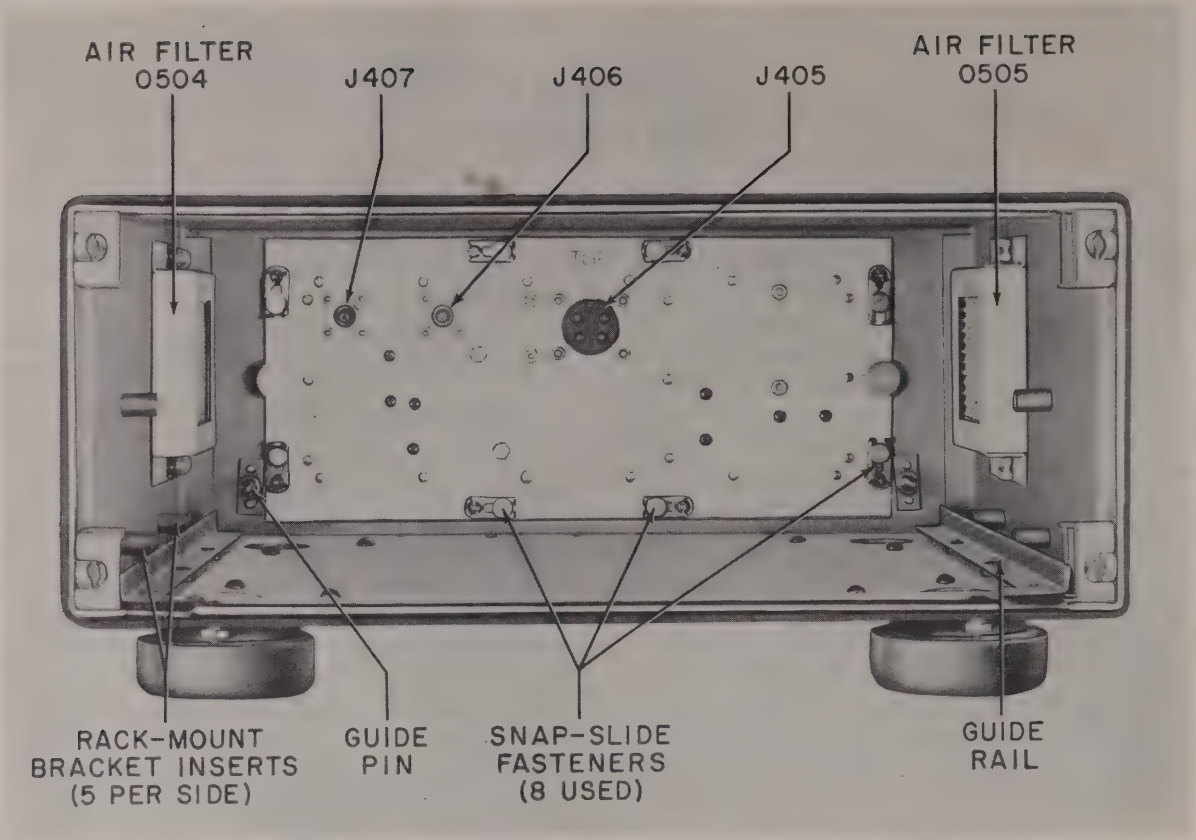


Figure 3–3. Interior of Cabinet with Chassis Removed

tube is wrapped in several thicknesses of Kimpak batting and placed on the receiver chassis within the receiver cabinet.

To reinstall tube V301, loosen the tube clamp (attached to chassis), if in closed position, by flipping the toggle. Insert the tube and then tighten the tube-clamp toggle, using a screwdriver shaft if the space is too cramped for the fingers.

c. INSPECTION.—Before installing or operating the radio receiver, inspect the equipment for possible damage or disarrangement during shipment. Check to see that no nuts, washers, bits of solder or other foreign particles have become lodged where they might cause a short circuit. A careful search should also be made for broken wires and loose connections, since a detailed mechanical inspection at this time may save much inconvenience in the long run. All mechanical controls should be operated in each alternate position, or through their full range of travel, in order to detect any bent shafts or other evidences of abnormal operation. Tighten any screws or nuts which may have worked loose. Also check to see that all tubes are well-seated in their sockets, that all tube shields are firmly in place, that fuses F201 and F202 are in their holders, and that the holders are in place in the right-hand panel compartment.

d. CHECK OF TRANSFORMER CONNECTIONS.—The primary of power transformer T301 is tapped to permit operation of the receiver from a 50/60-cps power source of 105, 115 or 125 volts. When the equipment is shipped from the factory, T301 is wired for operation from a 115-volt, 60-cps source. If operation from a similar power source is to be employed, and the equipment has not been used heretofore, proceed directly to the instructions of paragraph 3, below. However, if the equipment has been used previously, or if the available power source is closer to 105 or 125 volts than to 115 volts, it is necessary to check and possibly change the primary connections of transformer T301. As shown in figure 7–30, a brown wire is connected to terminal 3 of T301 for operation from a 115-volt source. For operation from a 105-volt source, move the wire from terminal 3 to terminal 2; for operation from a 125-volt source, move the wire from terminal 3 to terminal 4.

Note

For operation from a 50-cps source, use the next higher voltage tap on T301 with respect to the line voltage.

3. INSTALLATION.

a. LOCATION OF EQUIPMENT.—In locating the receiver, consideration should be given to the accessibility of a suitable source of 105/125-volt, 50/60-cps power, of the antenna lead-in, and of any supplemental equipment which may be employed. It should be located where adequate fresh clean air is available for

ventilation. Also, clearances should be adequate to permit removal of the chassis from the cabinet, and to permit access to tubes and adjustments in the preselector without complete removal of the chassis. Outline drawings, showing all pertinent dimensions, appear in figures 3–8 through 3–12.

Note

The latest applicable BuShips installation plans should be followed, regardless of the instructions specified in this section.

The receiver is shipped with four shockmounts attached, ready for installation on a table or bench. These should be removed and the angle brackets attached to the cabinet in their stead, if the receiver is to be installed in a standard relay rack.

(1) TABLE OR BENCH MOUNTING.—If the receiver is to be set up on a bench or table, and the installation is to be more than temporary, it should be bolted in place. To do this, drill four 3/8-inch diameter holes in the bench, in line with the centers of the shockmounts; dimensions are shown in figure 3–12. Remove the receiver chassis from the cabinet and drop a 5/16-inch diameter bolt through the hollow core of each shockmount and through the mating hole in the bench; thread on a nut against a suitable washer from the underside. These nuts should be drawn up tight, but not tight enough to place the shockmounts under compression; then a second nut should be added and jammed tight against the first to prevent loosening.

Before dropping the mounting bolts through the shockmounts, make sure that the phosphor-bronze ground strap provided is located in the hollow of one of the shockmounts so that the bolt passing through that shockmount will also pass through the large hole in one end of the strap. The other end of the strap should be fastened to the bottom of the cabinet by one of the four screws securing the shockmount involved.

(2) RELAY-RACK MOUNTING.—If the receiver is to be mounted in a standard 19-inch relay rack, it will be necessary to remove the four shockmounts from the bottom of the cabinet and to attach the two angle brackets provided to the sides of the cabinet; see figure 3–4. The shockmounts can be taken off by merely removing the bolts in the corners of their flange plates. The angle brackets are symmetrical in shape and are attached, one to each side of the cabinet, by means of No. 8–32 x 1/2-inch long Phillip's-head machine screws. Five holes in each bracket line up with five tapped inserts in each side of the cabinet; see figure 3–3. (The required screws will be found threaded into the tapped holes in the cabinet.) Removal of the shockmounts will also cause detachment of the phosphor-bronze grounding strap, which is ordinarily connected between one of the shockmount mounting screws and the 5/16-inch diameter cabinet mounting bolt which drops through the hollow core of the shockmount. This strap will not be needed for relay-rack mounting, but should be put in safe keeping for possible future use.

Note

Size "A" or larger spacer panel should be used between equipment when mounted in racks for shore installation.

b. EXTERNAL CONNECTIONS.—External connections are made to suitable connectors on Low-Pass Filter F–218/URR–35, which is attached to the rear

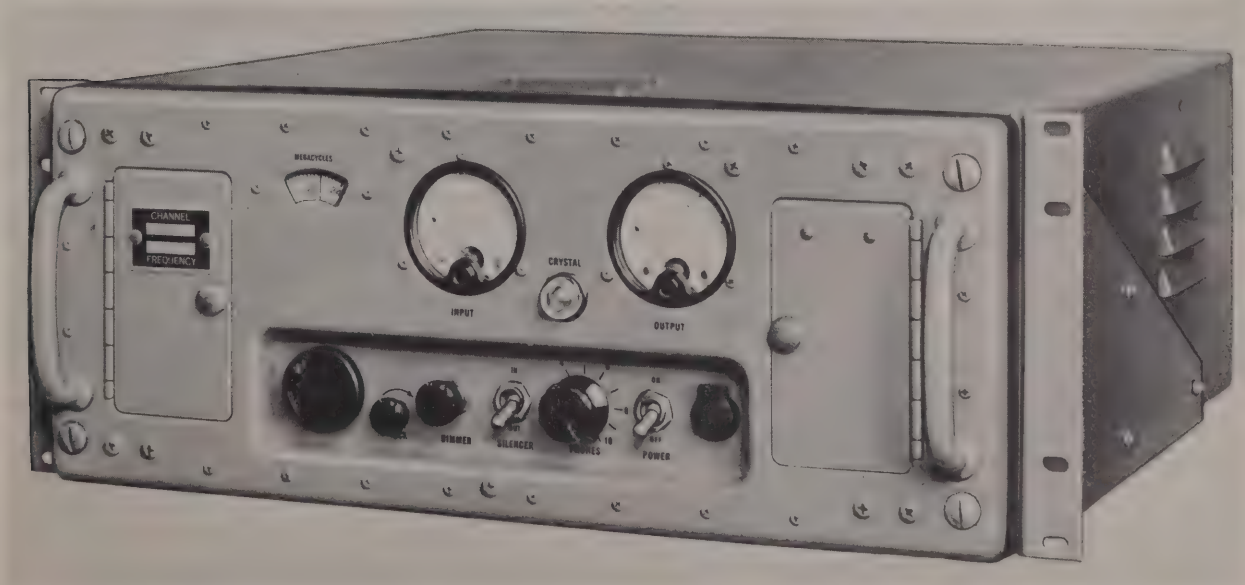


Figure 3–4. Radio Receiver R–482/URR–35, Relay-Rack Mounting Brackets Attached and Shockmounts Removed

of the receiver cabinet; see figure 1–3. Cables for making external connections to the receiver are not supplied, but connector plugs suitable for use with such cables are provided. The types and functions of these plugs are indicated in figure 3–5 and summarized in table 3–1.

Procedures for fabricating cables from coaxial transmission line and coaxial connectors are shown in figures 3–6 and 3–7.

The plug (P401) provided for the power cable has three female contacts. Contacts A and C connect to the a-c line and contact B to ground. Pins A and C on the 4-contact audio-output connector (P402) provide a balanced output connection for any audio-frequency load having an impedance between 60 and 600 ohms. Pin B of this connector is connected to ground, and pin D is unused.

If the receiver audio output is to be connected in parallel with the audio output from other receivers of any type, an isolating device must be used to prevent the audio output from being severely attenuated by an impedance mismatch, which will almost invariably result from such connections. The isolating devices which should be used are as follows:

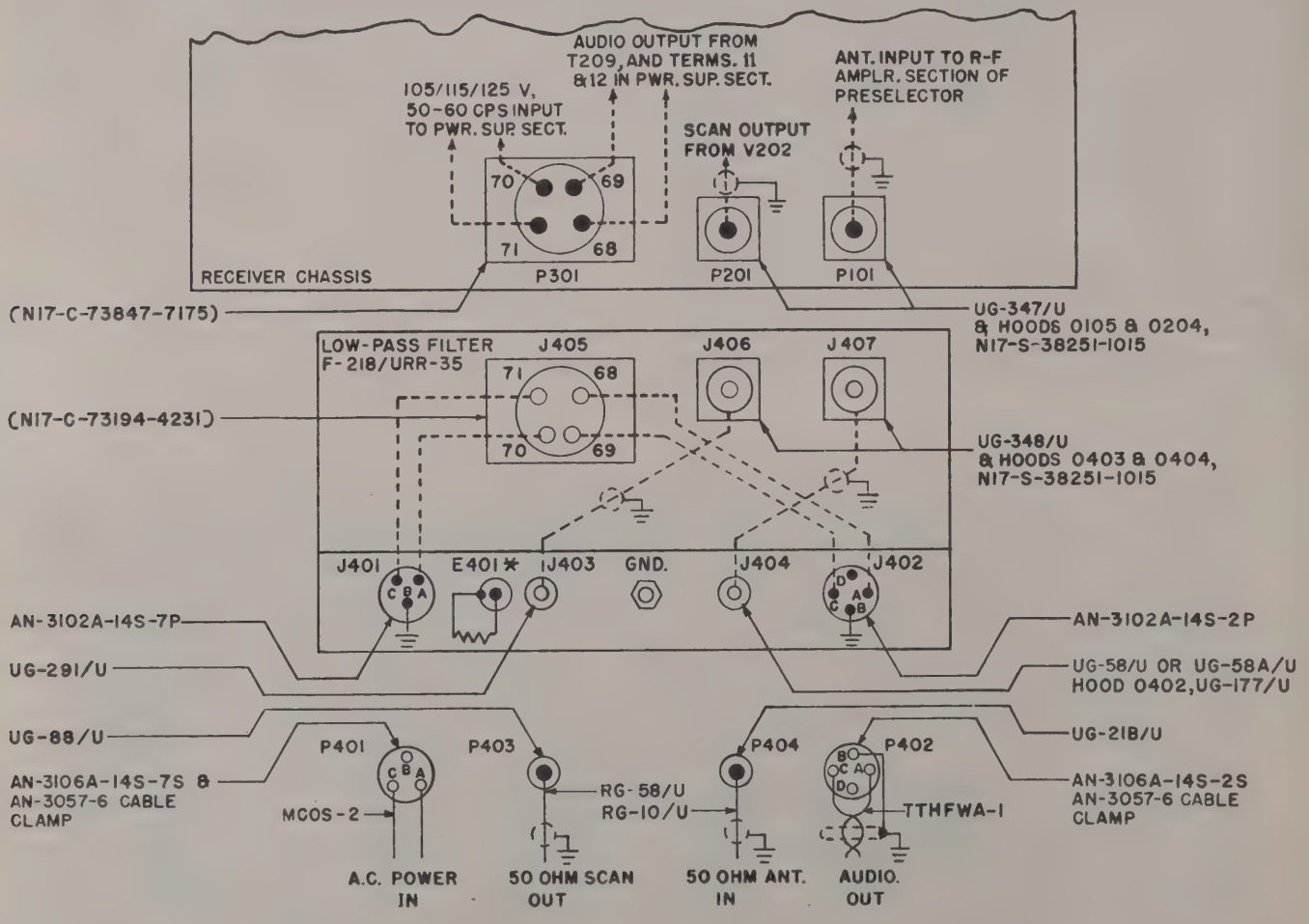
(1) At shipboard installations use Amplifier AM–215/U.

(2) At shore-station installations use Amplifier AM–413/U.

(3) At ship or shore installations where these amplifiers are not available, use an impedance-matching transformer which, when connected to the speaker, will present a 60-ohm load to the receiver output. (This 60-ohm impedance match provides maximum audio power from the receiver.)

Note

An impedance-matching transformer should be used only as an interim measure until the recommended amplifier can be installed.



* E401 ON BUSHIPS DWG. RE-49AA-399B, EXCEPT ITEM 4 IS 47 OHMS.

Figure 3–5. Connectors and Cables for External Connections

TABLE 3–1. CONNECTOR PLUGS SUPPLIED FOR EXTERNAL CONNECTIONS

REF. SYMBOL OF PLUG	TYPE OF PLUG	MATING RECEPTACLE	CABLE OR WIRE USED WITH PLUG	EXTERNAL CIRCUIT
P401	AN3106–14S–7S plug, AN3057–6 cable clamp	J401 (A.C. POWER)	MCOS–2	105/125-v, 50/60-cps, 1-ph. power source
P402	AN3106–14S–2S plug, AN3057–6 cable clamp	J402 (AUDIO)	TTHFWA–1	Audio output to interphone or other audio listening device(s)
P403	UG–88/U	J403 (50 OHM SCAN)	RG–58/U	Scan output to panoramic adapter (50-ohm impedance)
P404	UG–21B/U	J404 (50 OHM ANT.)	RG–10/U	Antenna input (50-ohm impedance)

The GND stud on the filter assembly, between receptacles J403 and J404, should be connected to the station ground via a short length of copper strap, not less than one-half inch wide.

4. INITIAL ADJUSTMENTS.

a. GENERAL.

(1) If not already in place, insert the crystal required for the desired channel of operation in the crystal holder in the left-hand compartment of the front panel; see figure 4–1. The correct crystal frequency to be used can be determined from the formula:

$$\text{Crystal frequency (in mc)} = \frac{\text{selected channel frequency (in mc)} + 18.6 \text{ mc}}{12}$$

(2) Connect one end of the a-c power cable to the A.C. POWER receptacle on the rear of the filter, and the other end to the a-c power source.

(3) Connect the cable from the transfer panel or speaker-amplifier to the AUDIO receptacle on the rear of the filter, or plug a headset into the phone jack (J501) on the front panel.

(4) Connect the antenna transmission line to the 50 OHM ANT. receptacle on the rear of the filter.

(5) If an auxiliary panoramic adapter is to be used, connect it by means of coaxial cable to the 50 OHM SCAN receptacle on the rear of the filter.

Note

When the scan-channel output is not utilized, the terminating cap (E401) attached by a chain to the filter housing (see figure 1–3) must be placed on the 50 OHM SCAN receptacle.

(6) Position the receiver controls (see figure 4–1) as follows:

(*a*) OSC. switch in CRYSTAL position.

(*b*) N.L. switch in OUT position.

(*c*) SILENCER switch in OUT position.

(*d*) A.F. LEVEL control turned fully clockwise.

(*e*) PHONES control in position 8.

(*f*) ALIGN-REC. switch in REC. position.

(7) Place the POWER switch in its ON position. After about four seconds the CRYSTAL neon lamp should light, indicating that the receiver is under crystal control and that plate power is on. If the panel is not illuminated properly, rotate the DIMMER control to bring lamps I501 and I502 up to the desired brilliance. After about two minutes' warm-up time, loosen the LOCK knob beside the tuning control.

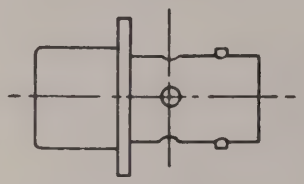
b. CRYSTAL-CONTROLLED TUNING. — Rotate the tuning control until the selected channel frequency appears on the calibrated dial visible through the window marked MEGACYCLES. This frequency will be equal to 12 times the crystal output frequency, less 18.6 megacycles. The dial reading will indicate approximate tuning. With no signal coming into the receiver, the exact setting is obtained by tuning for a maximum reading (maximum noise) on the OUTPUT meter or on the INPUT meter. The level which will be indicated on the OUTPUT meter should be between —5 db and +10 db. The indication on the INPUT meter may rise as high as 0.4 milliampere. With the noise level on the OUTPUT meter within the specified range, zero the INPUT meter by means of the INP. MTR. screwdriver-adjust potentiometer located in the right-hand compartment.

Note

Because a harmonic-mode crystal is used to control the oscillator circuit, it is possible that, at the frequencies mentioned below, resonance peaks will be observed at two different points in the frequency range when the receiver is being tuned for a maximum indication on the OUTPUT meter.

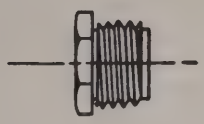
When tuning to a channel between 225 and 233 megacycles, the second response would occur at the high-frequency end of the band, between 387 and 400 megacycles. Conversely,

CABLE ASSEMBLY INSTRUCTIONS FOR BNC CONNECTORS



JACK BODY

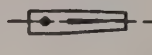
SLEEVE



NUT

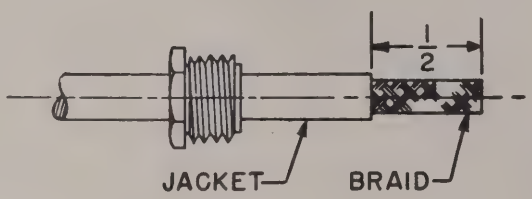
RG-59/U, RG-62/U OR RG-71/U CABLE IN UG-261/U OR UG-262/U JACKS

FEMALE CONTACT

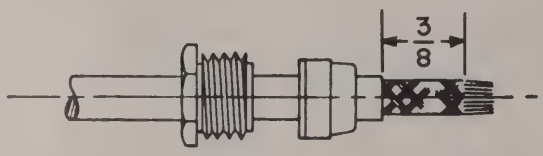


RG-58/U CABLE IN UG-89/U OR UG-90/U JACKS

FEMALE CONTACT



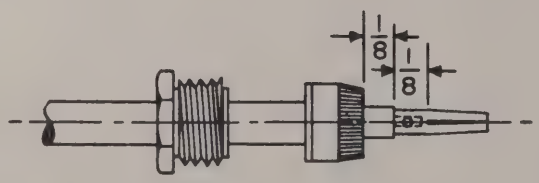
1. Cut off Jacket ½ inch from end, being careful not to nick braid.



2. Cut off inner insulation and wire under braid ⅜ inch from end of jacket.

   Taper braid.

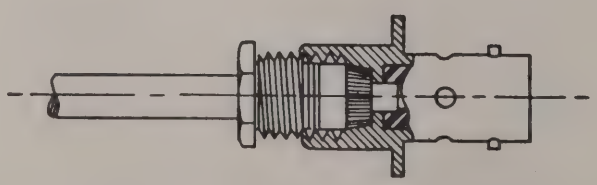
   Slide sleeve over tapered braid to fit tight against jacket. Be sure inner shoulder of sleeve fits squarely against end of cable jacket.



3. With sleeve in place, comb out braid, fold back smooth as shown, and trim 3/32 inch from end.

   Cut inner dielectric ⅛ inch from braid, being careful not to nick inner conductor and cut off inner conductor ⅛ inch from end of dielectric.

   Tin inside hole of female contact, tin center conductor of cable, slip female contact in place and solder. Remove excess solder. Be sure cable dielectric is not heated excessively and swollen so as to prevent dielectric entering body.



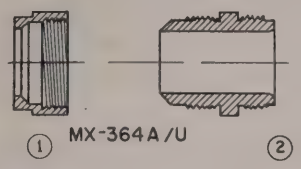
4. Push into body as far as it will go, then slide nut into body and screw into place, with wrench, until moderately tight. Hold cable and shell rigidly and rotate nut.

   This assembly procedure applies to 'BNC' Jacks. The assembly for plugs is the same except for the use of male contacts and a plug body.

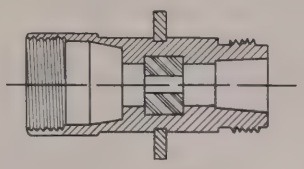
Figure 3–6. Assembling Connector Plug P403 to Type RG–58/U Cable

INSTRUCTIONS FOR ASSEMBLY

OF AN TYPE UG-21A/U, UG-21B/U, UG-22A/U, UG-22B/U, UG-23A/U OR UG-23B/U
CONNECTOR TO AN TYPE RG-10/U COAXIAL CABLE.

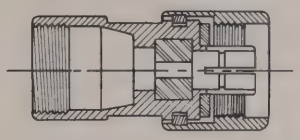


CABLE CLAMPING PARTS

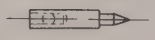


JACK BODY

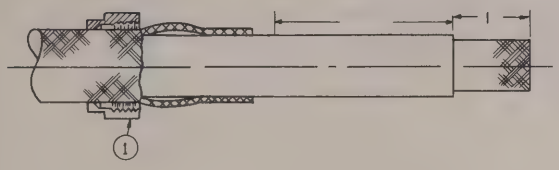
FEMALE CONTACT



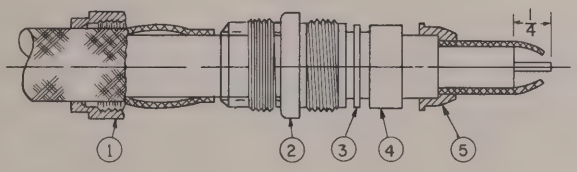
PLUG BODY



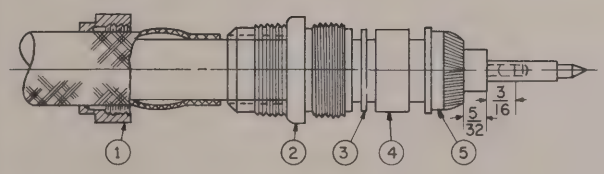
MALE CONTACT



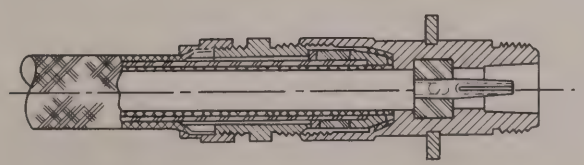
1. SLIDE PART #1 OVER ARMOR AND PUSH ARMOR BACK. CUT VINYLITE OUTER JACKET OFF, SQUARE AND EVEN, ONE INCH FROM END, BEING CAREFUL NOT TO DAMAGE WIRE BRAID.



2. PUSH WIRE BRAID BACK AND CUT OFF 1/4" OF DIELECTRIC. PULL BRAID FORWARD AGAIN AND TAPER INWARD AT END (IF NECESSARY FOR REMAINDER OF THIS STEP). SLIDE PART #2 OVER VINYLITE JACKET AND FOLLOW WITH PARTS #3, #4 AND #5, MAKING SURE THAT #5 CLEARS ALL BRAID WIRES AND THAT ITS INTERNAL SHOULDER RESTS SQUARELY AGAINST END OF JACKET.



3. UNBRAID ENDS OF WIRE SHIELD AND PULL OUT PARALLEL. THEN FOLD THESE BACK OVER PART #5 AND CUT OFF FLUSH WITH SHOULDER ON THIS PART. CUT OFF DIELECTRIC AGAIN, THIS TIME SO AS TO LEAVE 5/32" OF DIELECTRIC EXPOSED. CUT SQUARE AND EVEN, BEING CAREFUL NOT TO NICK CENTER CONDUCTOR. CUT OFF CENTER CONDUCTOR 3/16" FROM END OF DIELECTRIC AND TIN. SOLDER THIS TIP TO MALE OR FEMALE CONTACT. KEEP SOLDER AND FLUX OFF OF END OF DIELECTRIC, AND REMOVE EXCESS.



4. INSERT CABLE, AS ASSEMBLED, IN PLUG OR JACK BODY AS FAR AS IT WILL GO. PUSH PARTS #4 AND #3 INTO BODY, AND SCREW IN PART #2. HOLD BODY WITH WRENCH TO TIGHTEN, USING CARE NOT TO LET BODY OR CABLE ROTATE. PULL ARMOR FORWARD OVER TAPERED PORTION OF PART #2. CUT OFF EXCESS ARMOR AND UNBRAID ENDS FOR A SHORT DISTANCE. BRING PART #1 FORWARD TO CLAMP ARMOR BETWEEN THE TWO TAPERED SURFACES. BE CAREFUL THAT LOOSE ENDS OF ARMOR WIRES DO NOT EXTEND INTO SCREW THREADS AND JAM.

NOTE:

AN TYPE MX-364A/U CONNECTORS MUST BE USED WITH APPROVED CABLE.

Figure 3–7. Assembling Connector Plug P404 to Type RG–10/U Cable

when tuning to a channel between 387 and 400 megacycles, the second response would occur at the low-frequency end of the band, between 225 and 233 megacycles.

To prevent incorrect tuning of the receiver in the 225–233 and 387–400 megacycle ranges, the calibrated dial should be set at the approximate frequency of the desired channel. The final adjustment should then be made by peaking the OUTPUT meter for maximum noise indication.

c. MANUAL TUNING.—To operate the equipment as a continuously variable, manually tuned receiver, place the OSC. switch in its MANUAL position. This will cause the CRYSTAL neon lamp to go out. The receiver may now be tuned to any frequency within the 225–400 megacycle range by operation of the tuning control, as for crystal-controlled tuning. The sensitivity of the receiver is approximately the same for either crystal-controlled or manual tuning and will be greater than 8 microvolts, in series with 50 ohms, for a 10-db signal-to-noise ratio over the entire range.

d. NOISE LIMITER.—Place the N.L. switch, located in the right-hand compartment, in its IN position. Excessive noise at the receiving location should be reduced by the noise limiter. Regardless of the amount of received noise, however, cutting the noise limiter into the receiver circuit will result in a drop of approximately 3 db in the reading of the OUTPUT meter. The N.L. switch may be placed in either the IN or OUT position, depending upon the noise level at the receiving site.

e. SILENCER.—Place the front-panel SILENCER switch to its IN position. With no received signal, set the SILENCER screwdriver-adjust control, located in the right-hand compartment, at the point at which the noise level becomes inaudible. When making this adjustment, be certain that the A.F. LEVEL control is turned fully clockwise and the PHONES control is set to 8. Restore the SILENCER switch to its OUT position.

f. PANORAMIC ADAPTER. — If an auxiliary panoramic adapter is connected to the 50 OHM SCAN output of the receiver, refer to the handbook supplied with that equipment for complete instructions covering its initial adjustments.

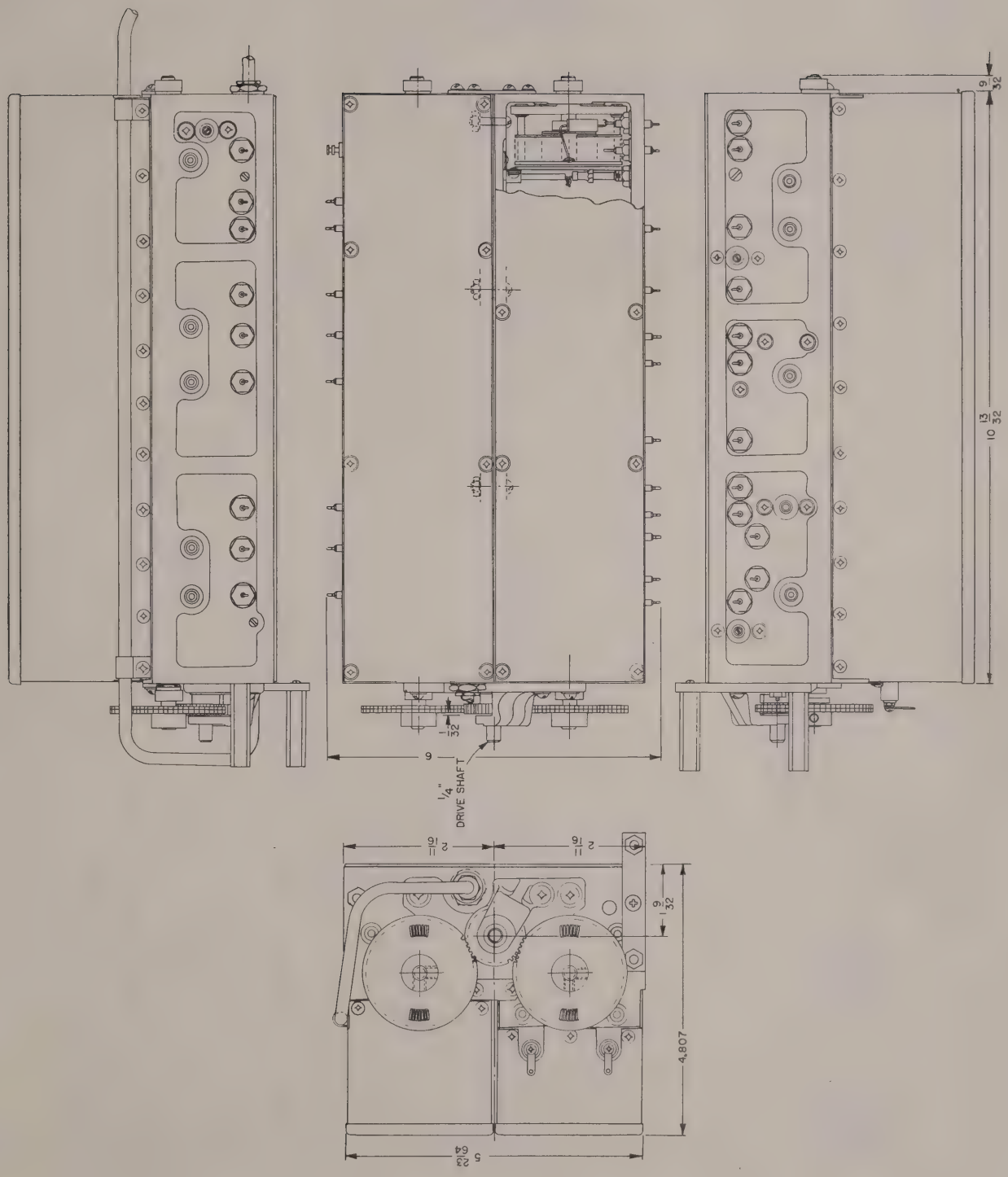


Figure 3–8. Preselector, Outline Drawing

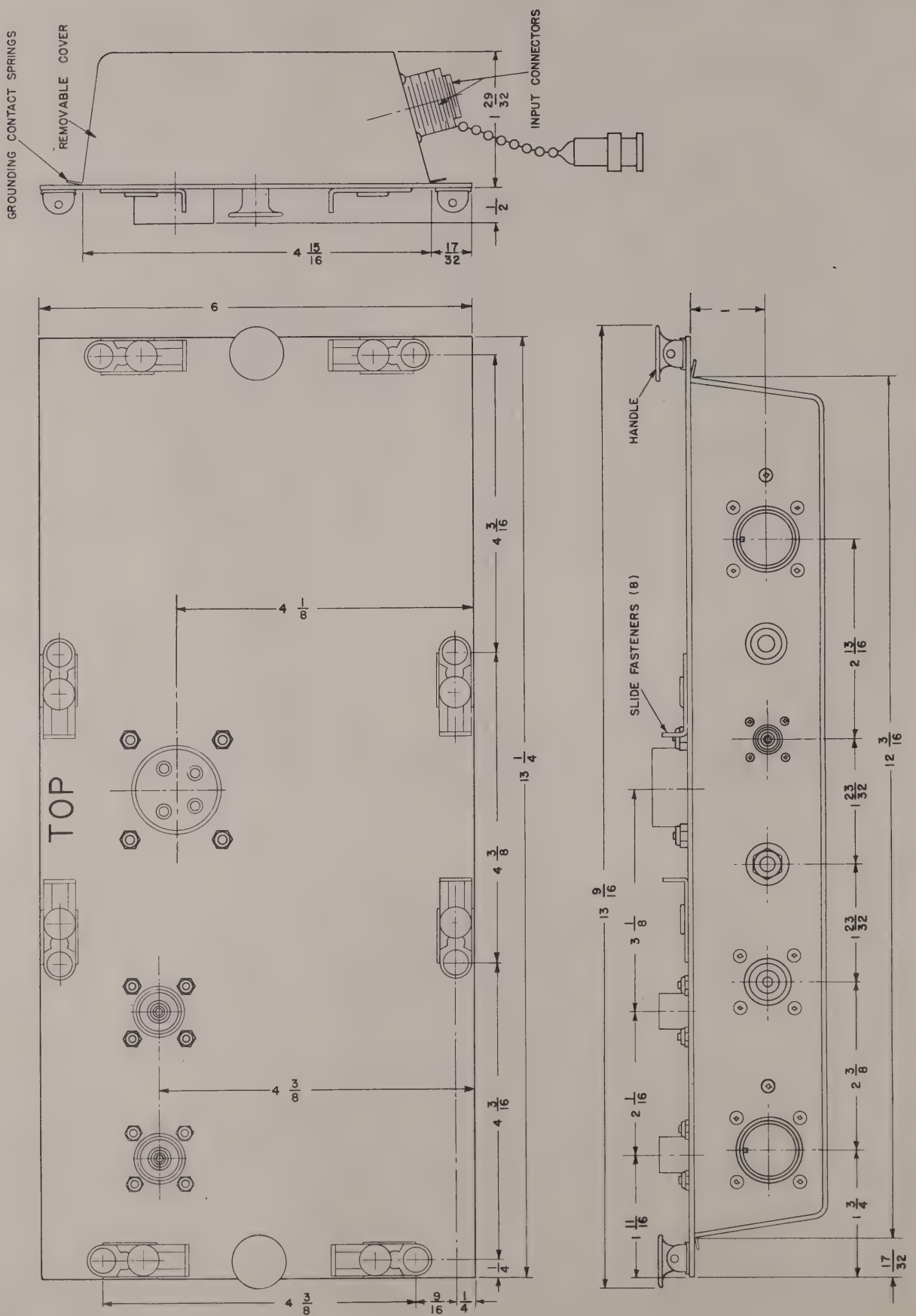


Figure 3–9. Low-Pass Filter F–218/URR–35, Outline Drawing

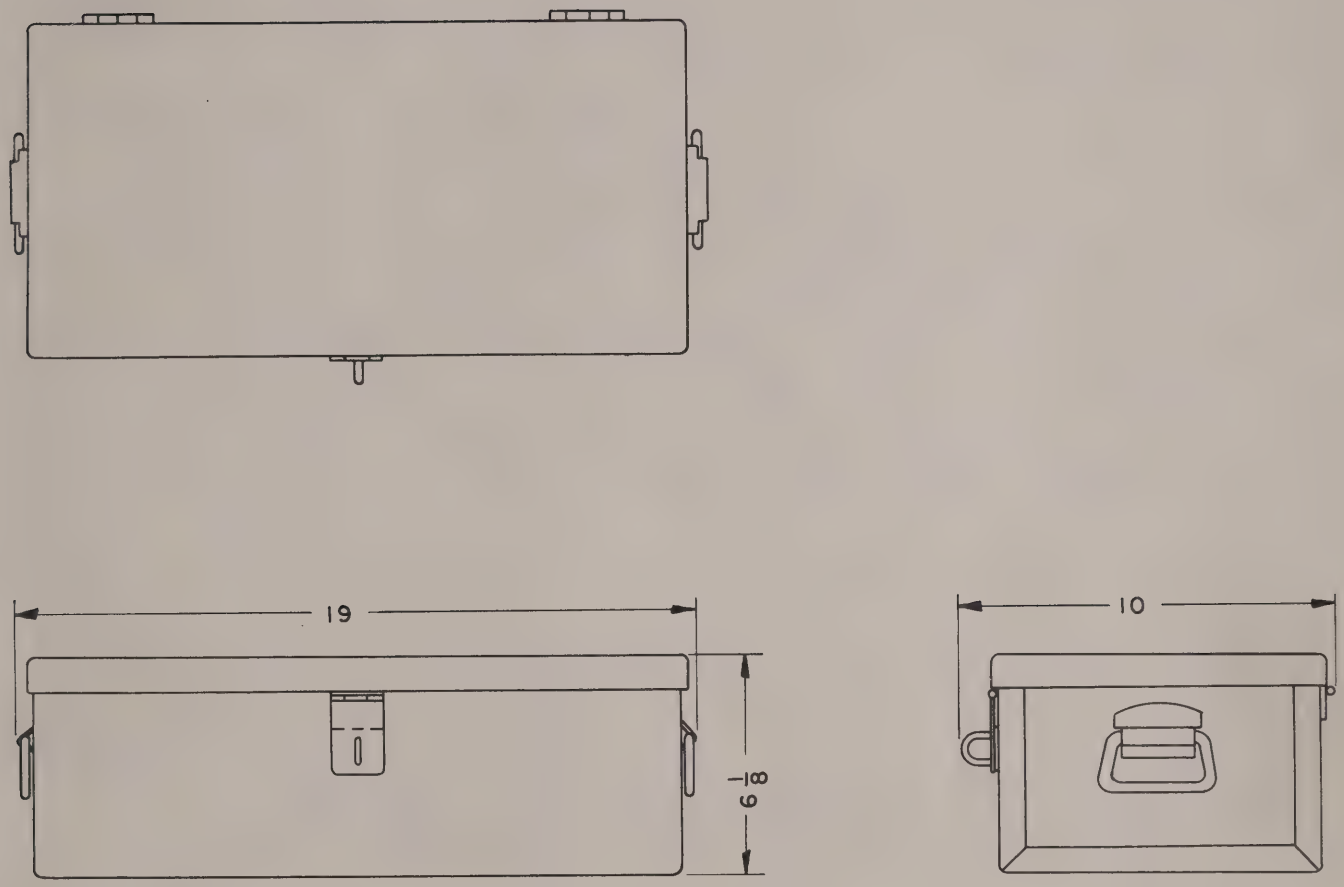


Figure 3–10. Maintenance Parts Box, Outline Drawing

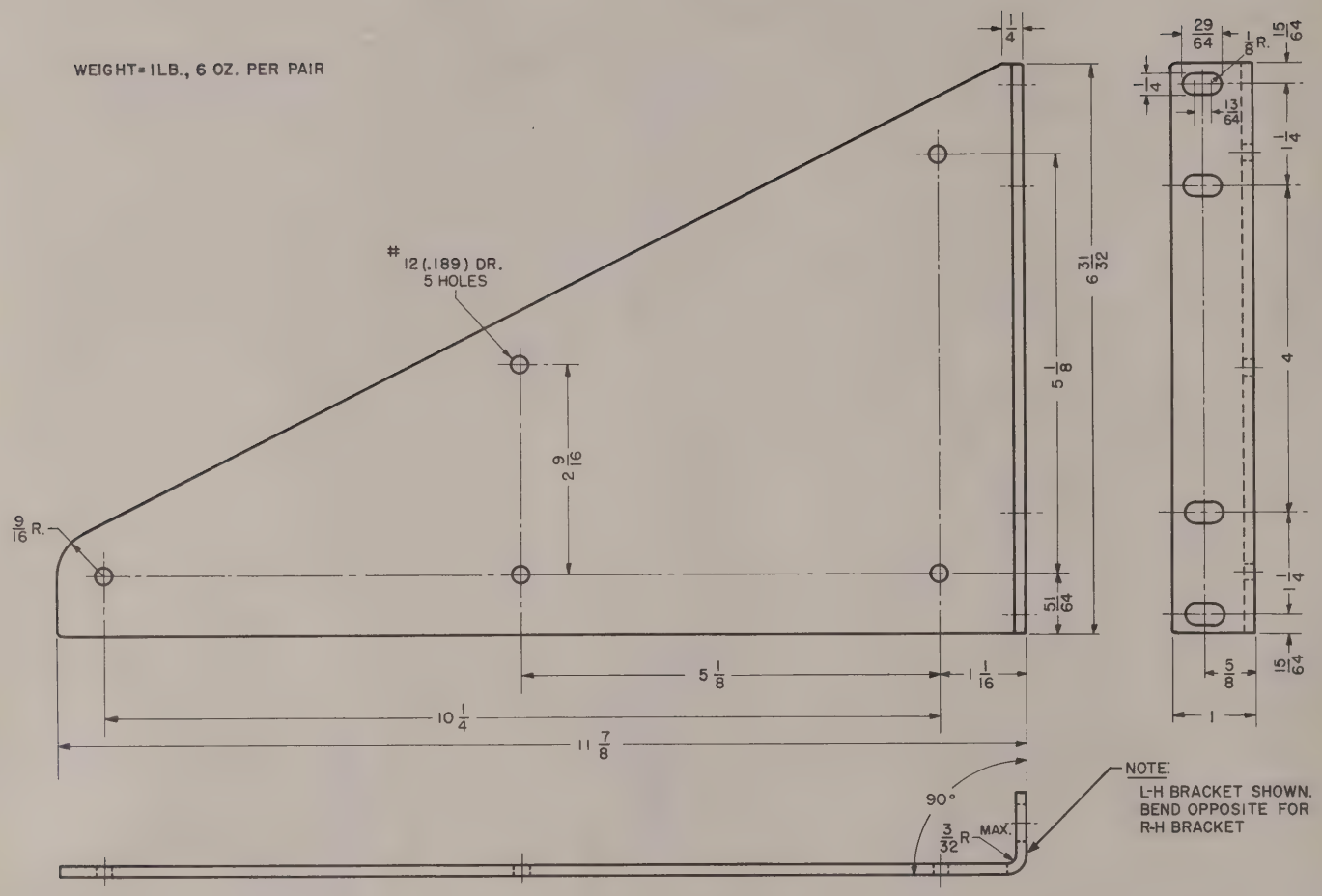
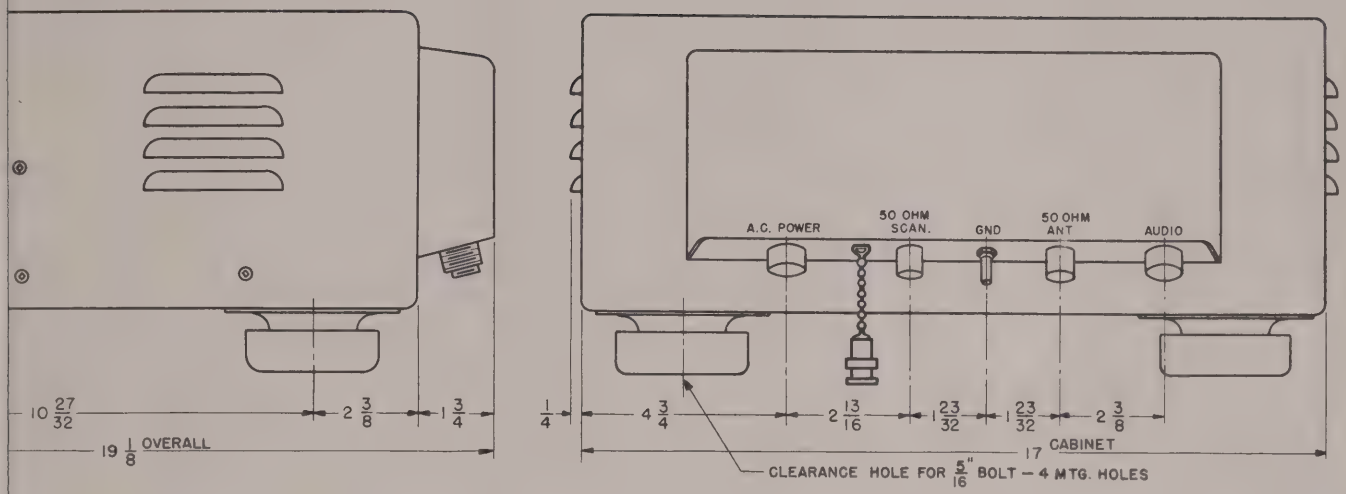
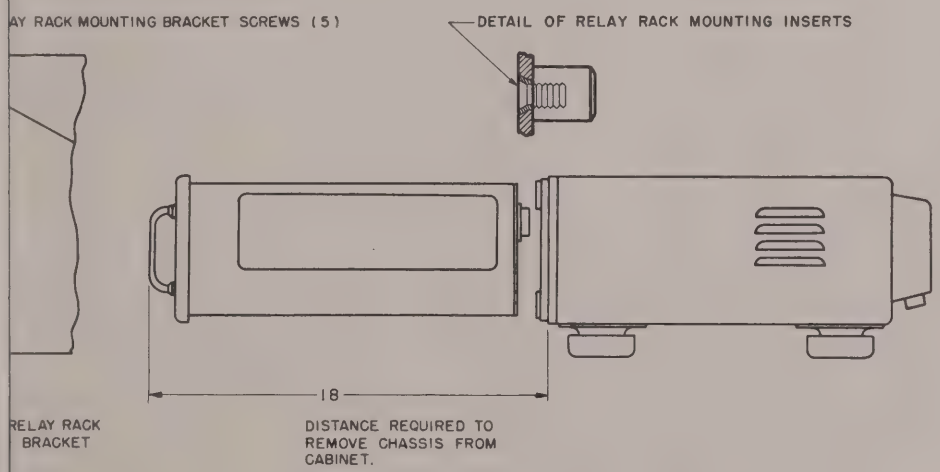


Figure 3–11. Relay-Rack Mounting Bracket, Outline Drawing





— 57 POUNDS WITH SHOCK MOUNTS, LESS RELAY RACK MOUNTING BRACKETS.
UIRED — 98 WATTS

Figure 3–12. Radio Receiver R–482/URR–35, Outline Drawing

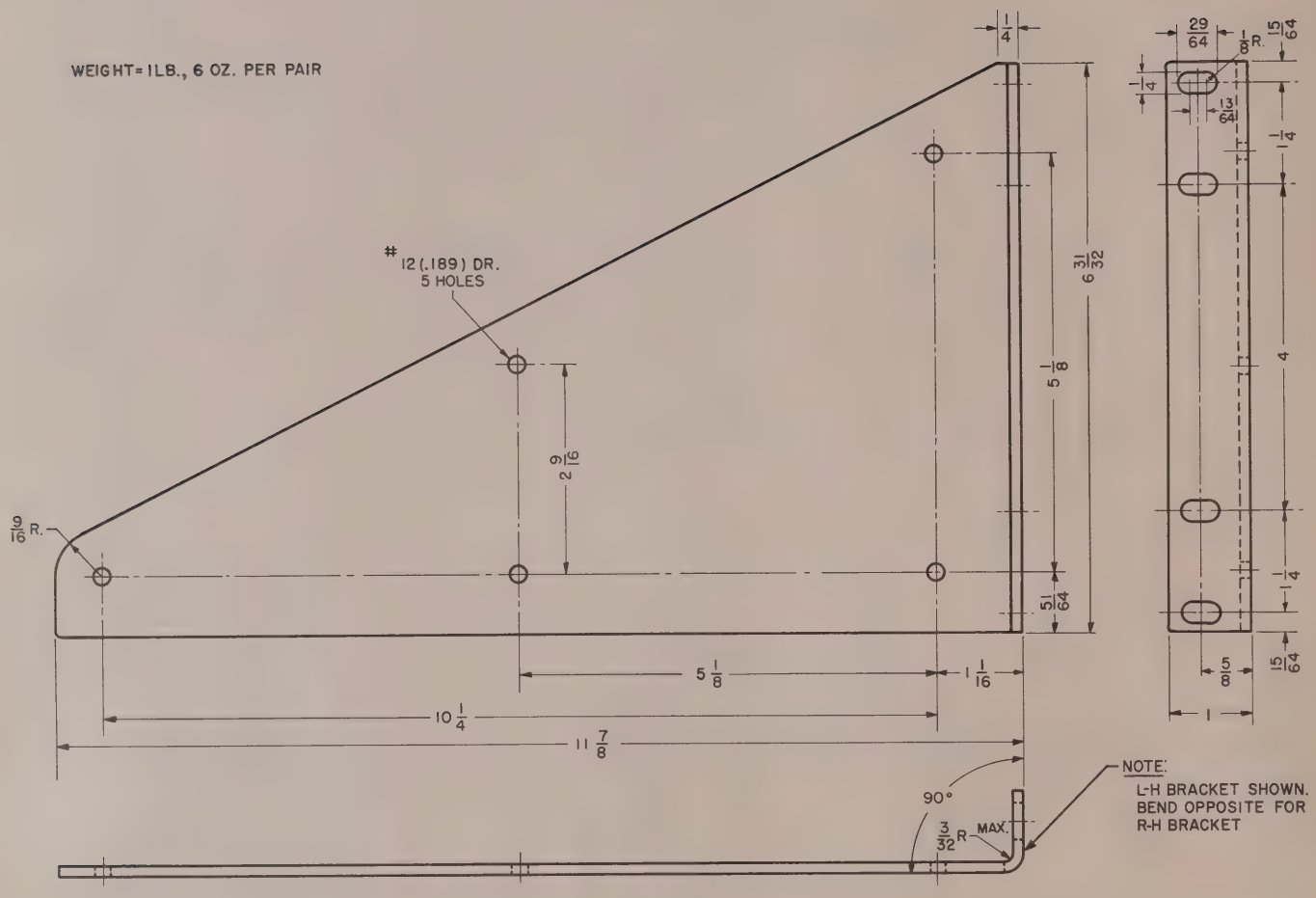
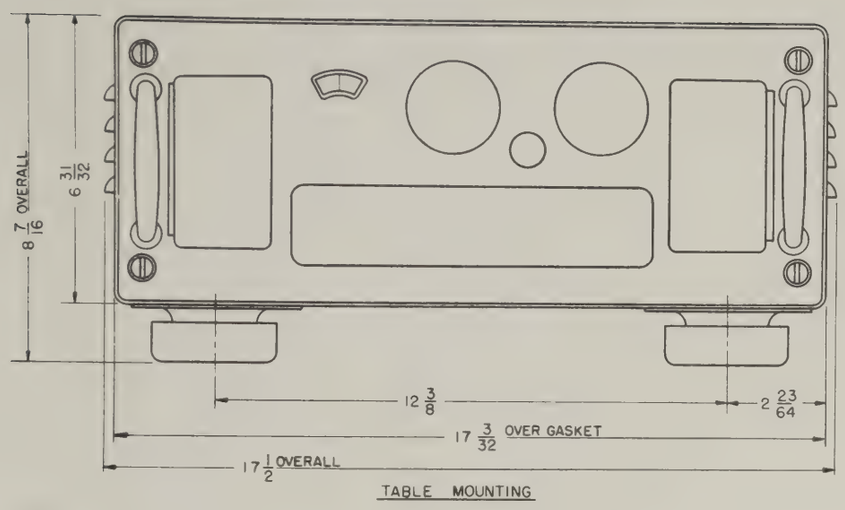
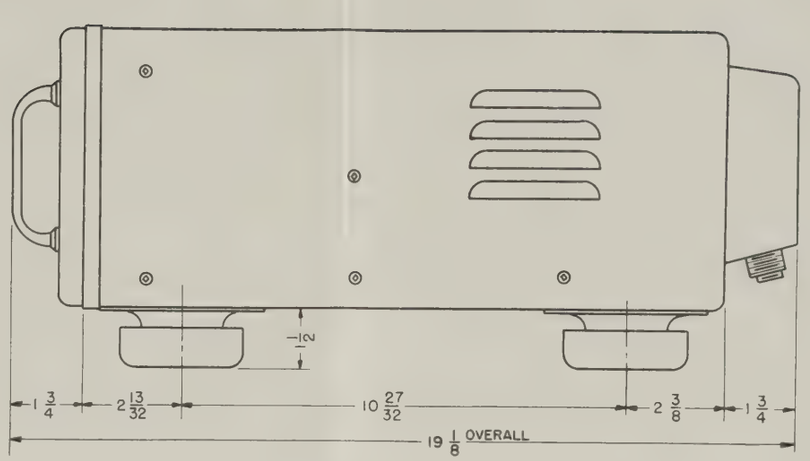
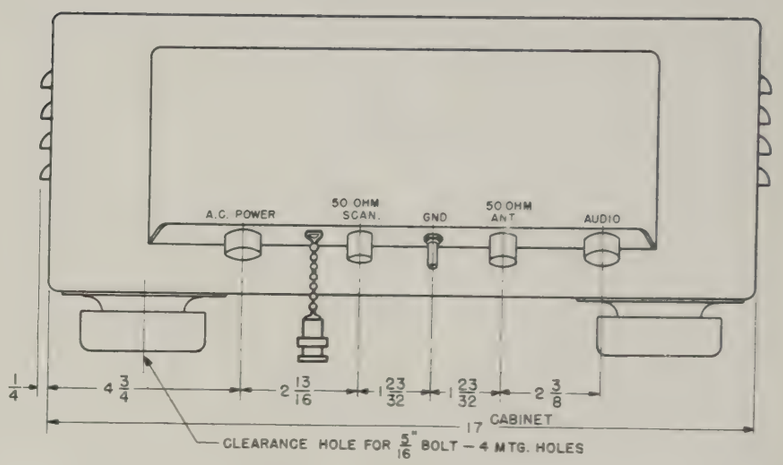
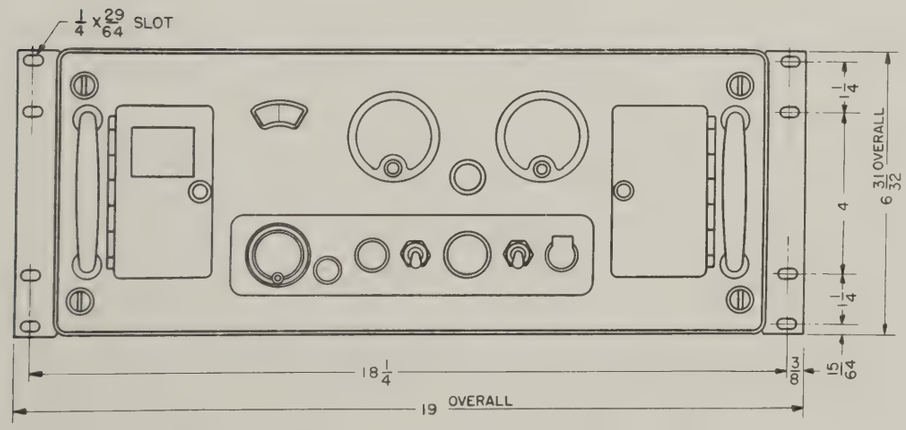


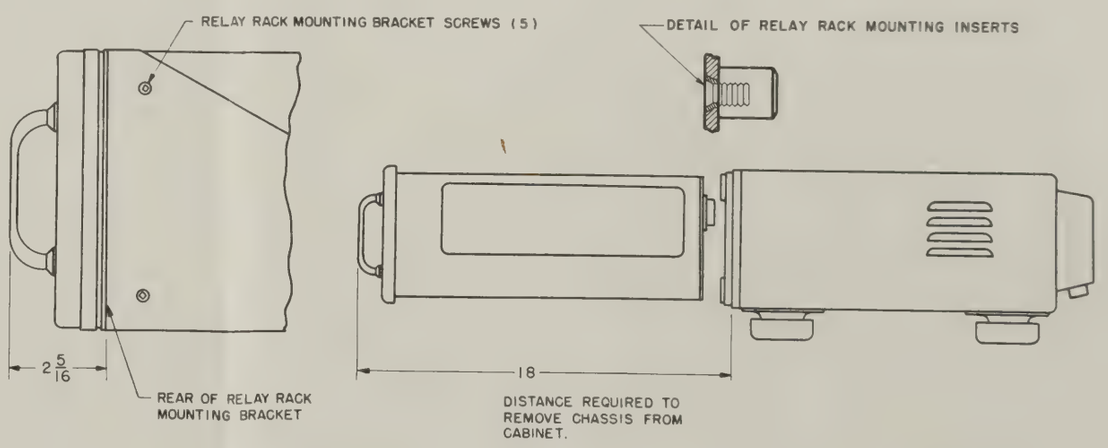
Figure 3–11. Relay-Rack Mounting Bracket, Outline Drawing











NOTE:
RECEIVER IS SUPPLIED WITH SHOCK MOUNTS AND RELAY RACK MOUNTING BRACKETS; SHOCK MOUNTS ATTACHED TO CABINET. FOR RELAY RACK MOUNTING, BRACKETS ARE FASTENED TO SIDES OF CABINET USING SCREWS IN INSERTS.

WEIGHT — 57 POUNDS WITH SHOCK MOUNTS, LESS RELAY RACK MOUNTING BRACKETS.
POWER REQUIRED — 98 WATTS

Figure 3–12. Radio Receiver R–482/URR–35, Outline Drawing

SECTION 4
OPERATION

1. INTRODUCTION.

It is assumed that before being turned over to the operating personnel, Radio Receiver R–482/URR–35 will have been installed, and all necessary adjustments made according to instructions given in Section 3. It is also assumed that those frequencies to which the receiver is likely to be tuned will have been determined and that suitable crystals for those frequencies will be ready at hand (if crystal-controlled tuning is to be employed).

The operator should be familiar with all controls on the panel of the receiver, and in the panel compartments, and should be able to tune the receiver to any channel in the 225-400 megacycle range of the equipment.

2. OPERATING CONTROLS.

a. LOCATION OF CONTROLS. — All controls which are required to operate the receiver are located on the front panel; see figure 4–1. Those which are used the most are recessed in the lower part of the central portion of the front panel, while the crystal and lesser used adjustments are enclosed in the two compartments on either side. The INPUT and OUTPUT meters, the panel lamp which indicates crystal operation, and the viewing window for the calibrated tuning dial are flush with the front panel above the recessed section.

b. FUNCTIONS OF CONTROLS.—The function of the various front-panel controls are described below. The paragraph number for each control corresponds to the index number in figure 4–1.

(1) "MEGACYCLES" DIAL.—This dial indicates the frequency to which the receiver is tuned, and is calibrated directly in megacycles.

(2) "INPUT" METER.—The INPUT meter provides a relative indication of the input signal level, and may also serve as a tuning indicator.

(3) "CRYSTAL" INDICATOR LAMP. — This lamp indicates, when lighted, that the receiver is crystal-controlled and is to be operated at the frequency determined by the crystal in the CRYSTAL holder.

(4) "OUTPUT" METER.—The OUTPUT meter indicates the audio output, in decibels, referenced to a level of 6 milliwatts into a 600-ohm load.

(5) FUSE.—The two line fuses (5 and 7, figure 4–1) are mounted in extractor-post holders, and protect the receiver circuits against damage which might be caused by short circuits or other circuit faults.

(6) "INP. MTR." ADJUSTMENT.—This screwdriver-adjust control is used to set the INPUT meter to zero in the absence of a received signal.

(7) FUSE.—Refer to subparagraph (5), above.

(8) SPARE FUSE.—A spare fuse for either of the two operating fuses is mounted in a fuse clip on the inside of the right-hand compartment door.

(9) "N.L." SWITCH.—The N.L. (noise limiter) switch permits the operator to cut the noise limiter IN or OUT of the receiver circuit. Whether or not the noise limiter is used depends upon the amount of noise at the receiving location.

(10) "SILENCER" CONTROL. — This screwdriver-adjust potentiometer is used to set the operating threshold of the silencing circuit. It is normally adjusted just beyond the point which cuts off the audio output in the absence of a received signal.

(11) "A.F. LEVEL" CONTROL. — The A.F. LEVEL screwdriver-adjust potentiometer is the gain control for the audio-frequency circuits in the receiver. Its adjustment is dependent upon the requirements of the listening equipment connected to the AUDIO output connector at the rear of the receiver.

(12) HEADPHONES JACK.—This jack provides means for using any standard headset with the receiver.

(13) "POWER" SWITCH.—The POWER switch is used to turn the receiver ON and OFF.

(14) "PHONES" CONTROL.—This potentiometer controls the volume of the audio output at the headphones jack, in conjunction with the A.F. LEVEL control. It is used to control the headphone volume after the A.F. LEVEL control has been preset to some specific gain, such as might be required by auxiliary listening equipment connected to the AUDIO output connector at the rear of the receiver.

(15) "SILENCER" SWITCH.—This switch permits the operator to switch the silencer circuit IN or OUT, depending upon the operating requirements and conditions at the receiving location.

(16) "DIMMER" CONTROL.—The DIMMER control adjusts the intensity of the panel-illuminating lamps.

(17) "LOCK."—When turned to its extreme clockwise position, as indicated by the arrow directly above it, the LOCK knob locks the tuning control to prevent accidental turning of that control.

(18) TUNING CONTROL.—This control is used to tune the receiver, the frequency of reception being indicated on the MEGACYCLES dial above it.

(19) "CRYSTAL" HOLDER.—The CRYSTAL holder mounts the frequency-determining crystal which is used for crystal-controlled operation.

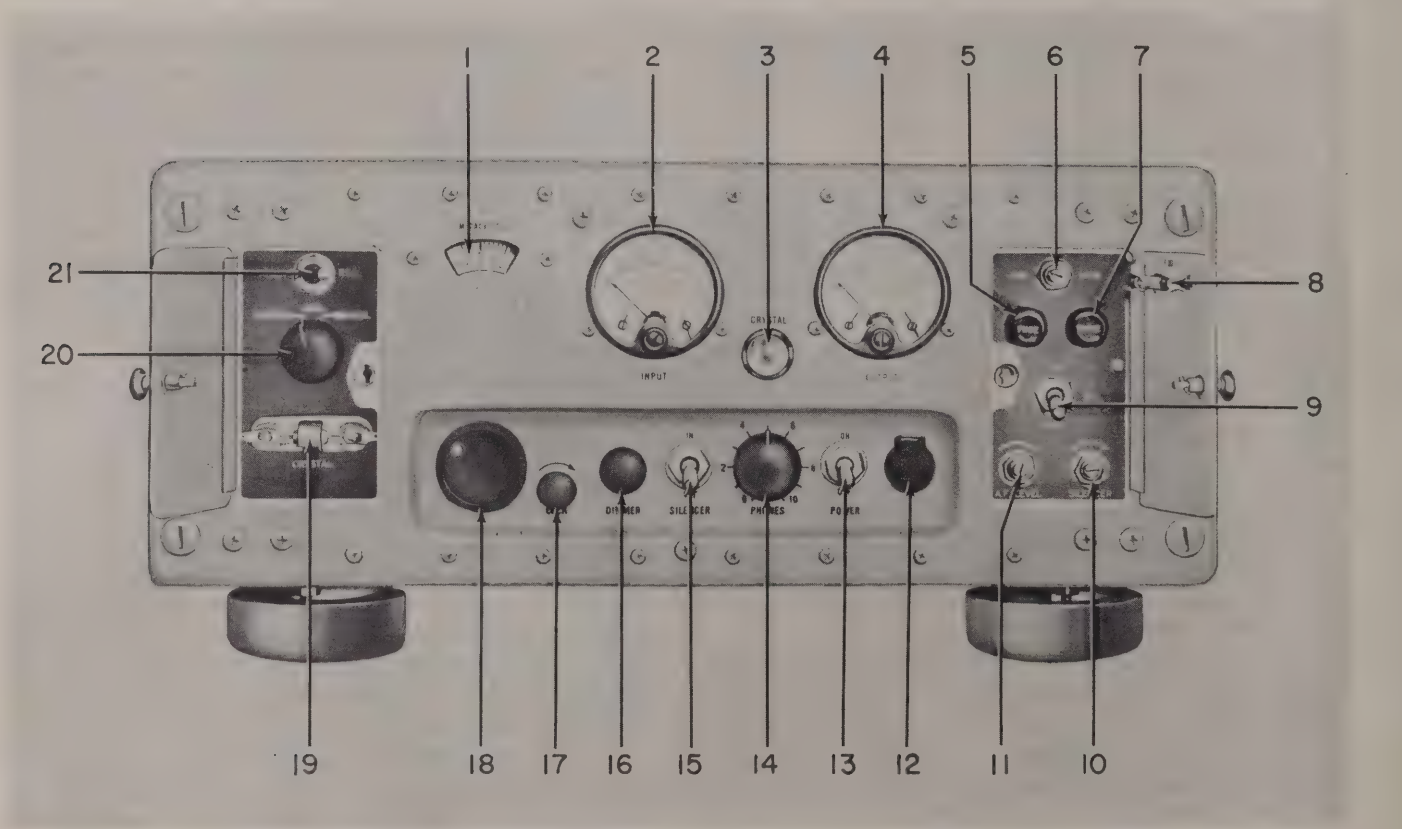
(20) "OSC." SWITCH.—The OSC. switch determines whether the receiver tuning is crystal-controlled (CRYSTAL position) or manually operated (MANUAL position).

(21) "ALIGN-REC." SWITCH. — This switch controls the functional operation of the INPUT meter. When the switch is in the normal REC. position, the meter functions as an input-level meter. The ALIGN switch position permits the meter to be used as an alignment indicator when such procedures are performed by maintenance personnel. In normal operation, this switch should always remain in the REC. position.

3. MODES OF OPERATION.

a. MANUAL TUNING.—With manual tuning, the receiver can be tuned continuously over the entire 225-400 megacycle range in the manner of any standard superheterodyne receiver. This range is covered by 19 complete turns of the tuning control, which stops automatically at each end of the tuning range. As the control is rotated, the frequency to which the receiver is tuned is indicated on the calibrated MEGACYCLES dial, which is apparent through the viewing window in the panel above. No adjustments other than rotation of the control are necessary, though it may be desirable at times to adjust the volume or cut the noise limiter and silencer circuits in or out.

b. CRYSTAL-CONTROLLED TUNING.—Crystal-controlled tuning allows the receiver to be tuned, at



1. MEGACYCLES Dial
2. INPUT Meter (M501)
3. CRYSTAL Indicator Lamp (I503)
4. OUTPUT Meter (M502)
5. Fuse (F201)
6. INP. MTR. Adjustment (R218)
7. Fuse (F202)
8. Spare Fuse (F203)
9. N.L. Switch (S202)
10. SILENCER Threshold Control (R247)
11. A.F. LEVEL Control (R255)
12. Headphones Jack (J501)
13. POWER Switch (S502)
14. PHONES Gain Control (R502)
15. SILENCER Switch (S501)
16. DIMMER Control (R501)
17. Tuning LOCK (E502)
18. Tuning Control (C101, C102)
19. CRYSTAL Holder (Y201)
20. OSC. Switch (S203)
21. ALIGN-REC. Switch (S201)

Figure 4–1. Radio Receiver R–482/URR–35, Operating Controls

any given time, to only the channel determined by the crystal installed in the CRYSTAL holder in the left-hand compartment. This mode of operation has the advantages of stability and freedom from drift, and an inherent capacity for sharper tuning. The essential difference between manual and crystal-controlled tuning is that the oscillator, instead of being a free-running oscillator which is made to track with the tuning of the incoming r-f signal, is a fixed-frequency oscillator whose frequency is controlled by the crystal employed.

4. OPERATING THE RECEIVER.

a. PREPARATION FOR OPERATION.

(1) Insert a headset into the front-panel jack and position the receiver controls (see figure 4–1) as follows:

(*a*) ALIGN-REC. switch in REC. position.

(*b*) N.L. switch in OUT position.

(*c*) SILENCER switch in OUT position.

(*d*) A.F. LEVEL control turned fully clockwise.

(*e*) PHONES gain control in position 8.

(*f*) OSC. switch in position for desired mode of operation—CRYSTAL for crystal-controlled tuning, MANUAL for manual tuning.

(2) Place the POWER switch in its ON position. If the receiver has been prepared for crystal-controlled operation (OSC. switch in CRYSTAL position), the CRYSTAL neon lamp should light approximately four seconds after power is applied. If the panel is not illuminated properly, rotate the DIMMER control to bring the pilot lamps up to the desired brightness. After about two minutes' warm-up time, loosen the LOCK knob and proceed with the instructions of subparagraph *b* or *c* below, as applicable.

Note

The receiver sensitivity is better than 8 microvolts for a 10-db signal-to-noise ratio, and is approximately the same for either crystal-controlled or manual tuning.

b. CRYSTAL-CONTROLLED TUNING. — If not already in place, insert the crystal required for the desired channel of operation in the CRYSTAL holder in the left-hand compartment of the front panel. The correct crystal frequency to be used can be determined from the formula:

$$\text{Crystal frequency (in mc)} = \frac{\text{selected channel frequency (in mc)} + 18.6 \text{ mc}}{12}$$

Be certain that the OSC. switch is in the CRYSTAL position. Then rotate the tuning control until the selected channel frequency appears on the calibrated dial, visible through the window marked MEGACYCLES. This frequency will be equal to 12 times the crystal output frequency, less 18.6 megacycles. The dial reading will indicate approximate tuning. With no signal coming into the receiver, the exact setting is obtained by tuning for a maximum reading (maximum noise) on the OUTPUT meter or on the INPUT meter. The level which will be indicated on the OUTPUT meter should be between −5 db and +10 db. If the indication on the INPUT meter is other than zero, readjust the INP. MTR. control, located in the right-hand compartment.

Note

Because a harmonic-mode crystal is used to control the oscillator circuit, it is possible that, at the frequencies mentioned below, resonance peaks will be observed at two different points in the frequency range when the receiver is being tuned for a maximum indication on the OUTPUT meter.

When tuning to a channel between 225 and 233 megacycles, the second response would occur at the high-frequency end of the band, between 387 and 400 megacycles. Conversely, when tuning to a channel between 387 and 400 megacycles, the second response would occur at the low-frequency end of the band, between 225 and 233 megacycles.

To prevent incorrect tuning of the receiver in the 225-233 and 387-400 megacycle ranges, the calibrated dial should be set at the approximate frequency of the desired channel. The final adjustment should then be made by peaking the OUTPUT meter for maximum noise indication.

c. MANUAL TUNING.—When the OSC. switch is in the MANUAL position, the receiver can be tuned to any frequency within the range of 225 to 400 megacycles by operation of the tuning control on the front panel. The frequency is indicated on the MEGACYCLES dial. With no signal being received, the indication on the OUTPUT metre should be between −5 db and +10 db. If the indication on the INPUT meter is other than zero, readjust the INP. MTR. control, located in the right-hand compartment. When tuning in a signal, tune for maximum indication on the INPUT meter.

d. SILENCER OPERATION.—If desired, the silencer (squelch) circuit may be put into operation by placing the SILENCER switch at its IN position and then adjusting the SILENCER control in the right-hand compartment for the desired silencing level.

Note

In setting the SILENCER control, extreme care should be exercised at all times in order that weak signals will not be lost.

The silencing level should ordinarily be the point at which noise just becomes inaudible under the conditions of no-signal input, with the A.F. LEVEL

control set for maximum and the PHONES gain control in position 8. Further silencing entails the danger of squelching weak signals which it might be desirable to hear. On the other hand, restraint in the use of silencing to less than complete silencing of noise, in the hope of picking up very weak signals, is useless because signals which do not exceed the noise level will be unintelligible in any case. Silencing beyond the minimum necessary for noise suppression would be permissible in the situation where a known signal is anticipated, and where that signal is known to be strong enough to override the "squelching" effect of the silencer circuit.

e. NOISE-LIMITER CIRCUIT.—If the noise level is excessive when a signal is being received, the N.L. switch in the right-hand panel compartment may be thrown to its IN position. This circuit acts as a noise-peak limiter and is effective in the reduction of interference or noise peaks of high intensity and short duration. For this reason it may not always be effective in limiting commutator hum and similar continuous noises, where no large abrupt peaks are present. Because the noise-limiter circuit may cause slight distortion of deeply modulated signals, it should be switched off where receiving conditions permit.

Note

Use of the noise limiter circuit will cause a drop of about 3 db in the indication on the OUTPUT meter.

f. "INPUT" METER.—The INPUT meter provides an approximate indication of the level, in microvolts, of the incoming signal. However, the relation between the level of the incoming signal and the position of the meter pointer is non-linear. Furthermore, this relation will vary with the frequency at which the receiver is operated, and also, slightly, between any two receivers operating at the same frequency. It is therefore desirable that a calibration chart be prepared, correlating measured values of signal level with corresponding meter readings. A typical chart is shown in table 4–1.

To prepare such a chart for an individual receiver, disconnect the antenna input cable from the 50 OHM ANT. receptacle and substitute the output of a calibrated r-f signal generator having a 50-ohm output impedance. With known values of input it is only necessary to observe the corresponding readings on the meter to complete the chart.

TABLE 4–1. TYPICAL "INPUT" METER CALIBRATION

INPUT (MICROVOLTS)	"INPUT" METER READING
0.5	.03
1.0	.07
2.5	.29
10	.60
50	.80
100	.86
1,000	.90
10,000	.95

5. DE-ENERGIZING THE RECEIVER.

In order to completely de-energize the receiver, it is only necessary to place the front-panel POWER switch in the OFF position.

SECTION 5
OPERATOR'S MAINTENANCE

1. GENERAL.

Although maintenance of a radio equipment is primarily the responsibility of technical personnel, it is nevertheless essential that the operator keep watch over the equipment during use in order that minor defects may be discovered, and either corrected or reported before major trouble develops.

It is suggested that the routine operational check outlined below be made at the beginning of each watch, or when operation is resumed after more than six or eight hours of idleness.

2. ROUTINE OPERATIONAL CHECK.

The checks tabulated in table 5–1 should be made hourly during operation, and at the beginning of each watch.

3. EMERGENCY MAINTENANCE.

a. GENERAL.—In addition to making the routine checks outlined in table 5–1, the operator should be sufficiently familiar with the equipment to be able, in an emergency, to rectify minor damage or disarrangements which might develop during battle or other periods of emergency when technical aid is not immediately available. Under such conditions, tube and fuse failures will be the most likely and the most frequent causes of trouble. The information in the following paragraphs is provided to enable operating personnel to recognize those symptoms which indicate trouble in these components.

Notice to Operators

Operators shall not perform any of the following emergency maintenance procedures without proper authorization.

b. REPLACEMENT OF FUSES.—The two 2-ampere, 250-volt, type 3AG glass-tube fuses located in the right-hand panel compartment (F201 and F202) are the only fuses used in Radio Receiver R–482/URR–35; see figure 4–1. These protect the 115-volt, 50/60-cps primary circuit. If one of these fuses blows, it should be replaced with one of exactly the same rating, and then only after the circuit has been checked to make certain that no obvious fault exists. The Standard Navy Stock Number for these fuses is 17–F–16302–100.

WARNING

Never replace a fuse with one of higher rating unless continued operation of the receiver is more important than the probable damage to it. If a fuse burns out immediately after replacement, do not make a second replacement until the cause of the trouble has been corrected.

A spare fuse (F203) is mounted in clips on the inside of the panel compartment door. Additional spare fuses should be kept at hand for replacement use. If fuse F201 and/or fuse F202 blows following a replacement, it is possible that the rectifier tube (V301) is faulty, and the operator may try replacement of this tube. (Refer to paragraph 3*c* of this section.) However, if this fails to correct the trouble, further servicing must be entrusted to qualified maintenance personnel.

c. REPLACEMENT OF ELECTRON TUBES.—The full complement of electron tubes used in Radio Receiver R–482/URR–35 is given in table 1–4. These tubes are all located in either the preselector unit, or

TABLE 5–1. ROUTINE OPERATIONAL CHECK CHART

WHAT TO CHECK	HOW TO CHECK	REMARKS
Dial lamps	Check visually to see that lamps are lighted when DIMMER control is rotated to maximum clockwise position.	Failure of one lamp is fault in lamp. Failure of both probably indicates power failure. Check fuses and A.C. POWER input connection.
CRYSTAL neon glow lamp	Check visually to see that lamp glows when OSC. switch is in CRYSTAL position.	Unlighted lamp indicates loss of plate voltage. Failure of lamp itself very unlikely.
Receiver operation	Turn A.F. LEVEL control to maximum clockwise position and throw SILENCER switch to OUT position. OUTPUT meter should indicate noise output.	A reading of between −5 db and +10 db on OUTPUT meter indicates normal operation of receiver.
External cables and connectors	Check connectors at rear of receiver for looseness or intermittent connection.	Loose connections may cause intermittent operation.

in the IF/AF section or the power supply section of the receiver chassis. Their locations are shown in figures 2–2 and 7–5.

Access to tubes in the IF/AF section is gained by releasing the four fasteners in the corners of the front panel and withdrawing the chassis as far as the mechanical stops will permit. Access to tubes in the power supply section is gained by releasing these stops in the manner shown in figure 3–2 and removing the chassis from the cabinet. To gain access to the tubes in the preselector, the shielding covers at the left side of the chassis must be removed; see figure 7–12. This is best done with chassis resting on its right side.

If the receiver fails to operate, but the dial lamps remain lighted indicating the presence of primary power, the cause may be attributable to tube failure. Since it will not be known which tube has failed, each tube in the receiver should be replaced with a tube, of the same type and known to be good, in the following order until the defective one is located: first, those in the power supply section; next, those in the IF/AF section; and finally, those in the preselector unit.

Note

In the receiver, as shipped from the factory, all tubes are of "reliable" construction except for the type 0A2 and 0B2 voltage regulators (V303 and V302, respectively) in the power supply and the type 6AK6 audio output tube (V210). When making replacements, "reliable" tubes should be used wherever possible.

The type 5654/6AK5W pentode utilized in the receiver is similar to a type 6AK5 pentode. Also, the type 5726/6AL5W twin diode is similar to a type 6AL5. In an emergency, a 6AK5 or 6AL5 may be used to replace its counterpart.

SECTION 6
PREVENTIVE MAINTENANCE

1. GENERAL.

While Radio Receiving Set AN/URR–35 has been designed and built to give as continuous and trouble-free operation as possible, a certain amount of wear and deterioration must be expected in any apparatus of this nature. If detected and corrected at an early stage, trouble from these causes can be minimized. However, if nothing is done until trouble actually occurs, a serious shut-down may be necessary at a time when use of the equipment is most needed.

2. ROUTINE MAINTENANCE CHECKS.

Since wear and deterioration, though they represent potential trouble, are not always evident in themselves, it is essential to continued trouble-free operation that certain vital points be inspected periodically, and that necessary replacements and adjustments be made when discovered. Such systematic inspection and adjustment will insure consistent operation, and will increase the efficiency and life of the equipment.

Note

THE ATTENTION OF MAINTENANCE PERSONNEL IS INVITED TO THE REQUIREMENTS OF CHAPTER 67 OF THE *BUREAU OF SHIPS MANUAL,* OF THE LATEST ISSUE. PERSONNEL ARE ALSO REQUESTED TO READ THE SAFETY INSTRUCTIONS INCLUDED IN THE FRONT MATTER OF THIS BOOK.

A practical working schedule is outlined in this section. However, it may be found desirable to modify this schedule as experience dictates, since the exact intervals at which certain maintenance procedures must be performed will be determined by such factors as the operating schedule of the station or ship, and prevailing atmospheric conditions.

Suggested routines for periodic electrical and mechanical inspection are given in the routine maintenance check chart, table 6–1.

Note

To gain access to the wiring and components, release the four fasteners in the corners of the front panel and withdraw the chassis as far as the mechanical stops will permit. Then, release the stops as shown in figure 3–2 and remove the chassis from the cabinet.

3. LUBRICATION.

No part of Radio Receiving Set AN/URR–35 requires lubrication at any time as a preventive measure against damage to the equipment. However, a thin coat of ball and roller bearing lubricant, Navy Specification 14–L–3, applied to the tops of the guide rails on either side of the cabinet (see figure 3–3) every three or four months, will facilitate removal of the chassis from the cabinet, and its reinsertion. This same grease can be applied very sparingly to the alignment pins at the rear of the cabinet and to the four fasteners which secure the chassis in the cabinet.

Note

When ordering lubricant, Navy Specification 14–L–3, refer to Standard Navy Stock Number W14–L–84–900 for 1-lb can, or W14–L–84–910 for 5-lb can.

Also, if operation of the dial-drive mechanism becomes sluggish due to accumulated dust and grit in the gears, it may be advisable to clean and relubricate the gears, as explained in figure 6–1. To clean the gears, use a small brush generously charged with Solvent 140F (Specification MIL–S–16067) and start with the top gear and work down. To relubricate, apply a coating of the above-mentioned lubricant to the teeth of the accessible gears, using a suitable camel's-hair brush (Standard Navy Stock Number 38–B–725).

Note

When ordering Solvent 140F, refer to Standard Navy Stock Number G51–S–47118–10 for a 5-gallon can.

4. RE-TROPICALIZATION.

In manufacture, Radio Receiver R–482/URR–35 is not tropicalized as a complete assembly, but instead, use is made of materials and parts which are either inherently moisture- and fungus-resistant, or which have been tropicalized individually prior to assembly in the receiver. Since the repair parts provided are identical with the parts used in the equipment, pre-tropicalized parts will be replaced with pre-tropicalized parts and the over-all resistance of the equipment to moisture and fungus should be unaffected.

TABLE 6–1. ROUTINE MAINTENANCE CHECK CHART

WHAT TO CHECK	HOW TO CHECK	PROCEDURE
	Monthly	
Chassis	Remove chassis from case and inspect for loose parts or leads, and for parts damaged due to overheating.	Tighten all loose screws, and all screws on terminal strips. Check all components showing distress for deviation from design values, and replace if necessary; also check circuits involved.
Receiver sensitivity and gain	Check as outlined in par. 3 of Section 7.	If sensitivity or gain is low, receiver will require tube replacement or alignment as outlined in par. 4 of Section 7.
Cables and connectors	Detach cables and examine insulation for possible damage. Examine cable connectors for loose, bent or dirty contacts; also for damaged threads and loose cable clamp screws.	If dirt or grease is present on contacts, clean with Solvent 140F (Specification MIL–S–16067).
Front panel and sub-panel controls, switches, knobs, etc.	Check for looseness of switch and control mounting nuts. Check for missing or loose knobs.	Tighten loose nuts, replace missing knobs and tighten loose knobs. A Bristol setscrew key for tightening knob setscrews is mounted at rear of sub-panel.
Blower operation	Check blower operation by closing contacts of thermostatic switch S301 (on rear of chassis behind preselector). This can be done by gently probing switch with an insulated rod when receiver is connected up for bench testing. (WARNING: 115v ac is present at S301.)	If closing of contacts fails to start blower, check connections to blower and blower capacitor. If necessary to replace blower, follow removal instructions given in par. 6*b* of Section 7. If blower is excessively noisy, replace bearings as outlined in par. 6*d* of Section 7.
Electron tubes	Check all electron tubes in mutual-transconductance tube tester, such as Tube Tester TV–3/U series. Replace any tube having transconductance value of less than 75 percent of normal. After test, replace each tube in its original socket.	When making tube replacements, the "reliable" models of all types should be used whenever possible.
	Quarterly	
*Air filters	Remove filter units from inside of cabinet by sliding the snap-slide fasteners and inspect.	Clean with solution of hot water and grease solvent, such as dishwashing compound (SNSN G51–E–1576–100). Let filters dry thoroughly. Dip in Military Symbol —2190T or —3100 lubricating oil, or equivalent (SAE 30 or 50), using heavier oil (—3100 or SAE 50) at higher operating temperatures. Let excess oil drain off for about one-half hour.
	Semi-Annually	
Receiver chassis and cabinet	Inspect receiver chassis, top and bottom, for loose parts, assemblies and chassis assembly screws. Inspect for dirt on tube sockets and in preselector housing. Inspect cabinet for loose mounting screws on track slides and shock mounts. Check for damage to parts due to overheating, etc.	Use a small brush (SNSN 38–B–375) charged with Solvent 140F (Specification MIL–S–16067) to clean dirt from tube sockets, etc.
Dial-drive mechanism	Observe smoothness of dial operation, and inspect gears in drive mechanism visually for evidence of grit and dirt in teeth.	If operation of dial drive indicates that the gears are sticky or binding, clean and re-lubricate in accordance with par. 3, this section, and figure 6–1.

* In installations at shore stations or in a ship which is tied up at a pier, the dust content of the air may be high. In such cases it is advisable to clean the air filters monthly or weekly, if necessary.

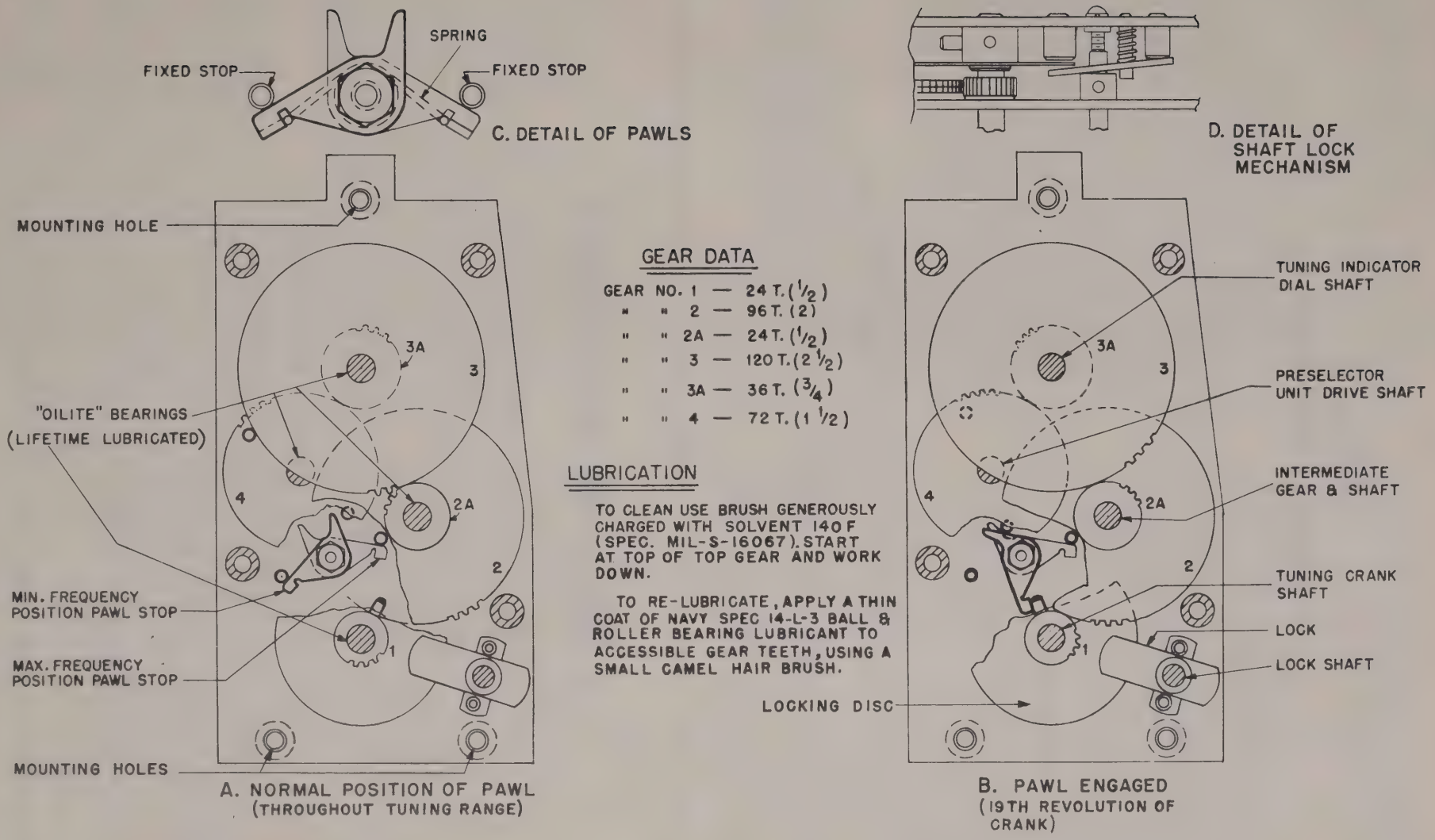


Figure 6–1. Dial-Drive Mechanism, Details and Lubrication

SECTION 7
CORRECTIVE MAINTENANCE

1. LOCALIZATION OF TROUBLE.

Corrective maintenance covers that phase of the care of the equipment dealing with the location and correction of trouble that has already occurred, and which is beyond the province of the operator to attempt to correct. For this work it is assumed that technical personnel with radio training are available.

WARNING

VOLTAGES ARE PRESENT IN THIS EQUIPMENT WHICH ARE DANGEROUS AND WHICH MAY BE FATAL IF CONTACTED. OBSERVE ALL SAFETY PRECAUTIONS; REFER TO THE SAFETY NOTICE INCLUDED IN THE FRONT MATTER OF THIS INSTRUCTION BOOK.

An important part of remedying defective equipment operation lies in the development, and proper use, of a systematic method of localizing the source of trouble to one particular stage or component of the receiver, or to as small a portion of the receiver as possible. Proper isolation of a source of trouble to a definite portion of the circuit is a time saver, in that it becomes possible to avoid the detailed inspection of those parts of the circuit which may be completely trouble-free.

For the most part, localization of the source of trouble can be accomplished by conventional "signal-tracing" methods. This method of trouble shooting entails a stage-by-stage check, starting either at the input of the receiver and tracing ahead, or at the output and checking backward, until a signal interruption is encountered. Regardless of the direction of checking, the defective stage will probably be that in which the signal first was found to be faulty.

2. TROUBLE SHOOTING.

a. GENERAL.—With the equipment properly installed, any irregularities which occur in the performance of the receiver will be attributable either to misadjustment of one or more of the controls, or to the failure of some part.

FAILURE REPORTS

A FAILURE REPORT must be filled out for the failure of any part of the equipment whether caused by defective or worn parts, improper operation, or external influences. It should be made on Failure Report, form NAVSHIPS 383, which has been designed to simplify this requirement. The card must be filled out and forwarded to BUSHIPS. Full instructions are to be found on each card.

Use great care in filling the card out to make certain it carries adequate information. For example under "Circuit Symbol" use the proper circuit identification taken from the schematic drawings, such as T–803, in the case of a transformer, or R–207, for a resistor. Do not substitute brevity for clarity. Use the back of the card to completely describe the cause of failure and attach an extra piece of paper if necessary.

The purpose of this report is to inform BUSHIPS of the cause and rate of failures. The information is used by the Bureau in the design of future equipment and in the maintenance of adequate supplies to keep the present equipment going. The cards you send in, together with those from hundreds of other ships, furnish a store of information permitting the Bureau to keep in touch with the performance of the equipment of your ship and all other ships of the Navy.

This report is not a requisition. You must request the replacement of parts through your Officer-in-Charge in the usual manner.

Make certain you have a supply of Failure Report cards and envelopes on board. They may be obtained from the nearest District Printing and Publication Office.

In most cases it will be possible to localize a particular fault from the general nature of the trouble encountered. Faulty or abnormal action of a particular control will often indicate the particular section of the receiver, and the specific portion of the circuit in which the trouble lies. Reference to the schematic diagram of figure 7–28, and to the simplified diagrams of figures 2–1 and 2–4 through 2–11 will aid in localizing particular faults.

In the case of the IF/AF chassis, a stage-by-stage test is simplified by the incorporation of several test jacks in the equipment. In the power supply circuits, where the signal to be traced is a supply voltage, the procedure to be used is basically the same, except that the voltage will be traced from the output back to the power transformer, rather than from stage to stage. In the preselector, a stage-by-stage check is relatively difficult to accomplish. However, trouble in the preselector can be verified by means of the sensitivity and gain measurements outlined in paragraph 3 of this section. Thereafter, the trouble can be localized to a particular stage by means of voltage and resistance measurements.

b. TROUBLE-SHOOTING CHART.—In tracing faults, an orderly and systematic procedure should be followed. The trouble-shooting chart, table 7–1, gives the symptoms of troubles commonly encountered in the left-hand column, the possible causes of these symptoms in the middle column and suggested corrective measures in the right-hand column .

Table 7–2 indicates approximate test input-signal levels which are required at the various i-f and a-f stages to produce a specified output. Reference to this table may often provide a rapid means of determining which stage or stages require repair or realignment.

TABLE 7–1. TROUBLE-SHOOTING CHART

SYMPTOM	PROBABLE CAUSE	REMEDY
1. Panel lamps do not light when POWER switch is placed in ON position.	1. *a.* DIMMER control improperly adjusted.	1. *a.* Turn control clockwise.
	b. Panel lamps burned out.	*b.* Replace lamps I501 and I502.
	c. Line fuse(s) blown.	*c.* Replace fuse F201 and/or F202.
	d. No primary power.	*d.* Cable disconnected at J401. Primary power cable defective. Open circuit between J401 and J405 in filter.
2. Line fuses blow repeatedly when replaced.	2. *a.* Replacement fuses of incorrect size.	2. *a.* Use 2-amp fuses.
	b. Rectifier tube defective.	*b.* Replace V301.
	c. Filter capacitor shorted.	*c.* Replace C301 and/or C303.
	d. Short circuit in primary, power supply or filament circuits.	*d.* Check tube-socket and terminal-board resistance; replace defective parts.
3. Blower does not operate after receiver has been operating for some time.	3. *a.* Low ambient temperature.	3. *a.* None—normal occurrence.
	b. Thermostatic switch defective.	*b.* Replace S301.
	c. Blower-motor capacitor defective.	*c.* Replace C304.
	d. Blower motor defective.	*d.* Repair or replace blower.
4. CRYSTAL panel lamp does not glow with OSC. switch in CRYSTAL position; receiver otherwise operative.	4. *a.* Neon lamp burned out.	4. *a.* Replace lamp I503.
	b. OSC.-switch contacts defective.	*b.* Clean, repair or replace S203.
5. Same as symptom 4, except receiver inoperative in either position of OSC. switch.	5. *a.* Rectifier tube defective.	5. *a.* Replace V301.
	b. Defective part or circuit in power supply.	*b.* Check and trouble-shoot power supply.

TABLE 7–1. TROUBLE-SHOOTING CHART (Cont)

SYMPTOM	PROBABLE CAUSE	REMEDY
6. Receiver operative with OSC. switch in MANUAL position, inoperative in CRYSTAL position.	6. *a.* Crystal not installed in CRYSTAL holder, or crystal frequency not between 20.1125 and 35.2167 mc.	6. *a.* Install crystal of proper frequency.
	b. CRYSTAL-holder contacts dirty or sprung.	*b.* Clean, repair or replace holder XY201.
7. INPUT meter cannot be set to zero with INP. MTR. potentiometer.	7. *a.* 2nd i-f stage defective.	7. *a.* Replace V204; trouble-shoot circuits.
	b. Meter circuit defective.	*b.* Check meter M501 and circuit resistors.
8. Weak signal, evidenced by low readings on both INPUT and OUTPUT meters.	8. *a.* I.F. GAIN control set incorrectly.	8. *a.* Readjust R233; see par. 4*e*, this section.
	b. Defective tube in i-f section.	*b.* Check V201 to V207; replace weak tubes.
	c. Defective tube in preselector.	*c.* Check V101 to V109; replace weak tube.
	d. I-f stages out of alignment.	*d.* Check IF/AF gain; see par. 3*c*(1), this section. Realign if necessary; see par. 4*c* and 4*d*, this section.
	e. Preselector out of alignment.	*e.* Check preselector gain; see par. 3*c*(2), this section. Realign if necessary; see par. 4*f* and/or 4*g*, this section.
	f. Defective part in i-f section.	*f.* Check voltages and resistances; replace defective part.
	g. Defective part in preselector.	*g.* Same as *f*, above.
9. Intermittent signal, evidenced by erratic indications of both INPUT and OUTPUT meters.	9. *a.* Defective tube in i-f section or preselector.	9. *a.* Tap each tube to locate defective one and replace.
	b. Loose or defective cable or connector.	*b.* Check all cables and connectors in receiver and filter; check external cables.
	c. Defective bypass capacitor.	*c.* Check all bypass capacitors in r-f and i-f stages.
10. No received signal, evidenced by no-signal indications on both INPUT and OUTPUT meters.	10. Same as item 8.	10. Same as item 8.
11. No audio output and no-signal indication on OUTPUT meter; normal reading on INPUT meter. (SILENCER switch in IN position.)	11. *a.* SILENCER control set improperly.	11. *a.* Readjust SILENCER potentiometer R247; see par. 4*d* of Section 4.
	b. Defective tube in detector, silencer, AGC or noise limiter circuit.	*b.* Check V206, V207 and V208; replace faulty tube.
	c. Defective part in silencer or AGC circuit.	*c.* Check voltages and resistances; replace defective part.
12. Same as sympton 11, except SILENCER switch in OUT position.	12. *a.* Defective tube in detector, noise limiter or a-f section.	12. *a.* Check V206, V208, V209 and V210; replace faulty tube.
	b. Defective part in a-f section.	*b.* Check voltages and resistances; replace defective part.

TABLE 7–1. TROUBLE-SHOOTING CHART (Cont)

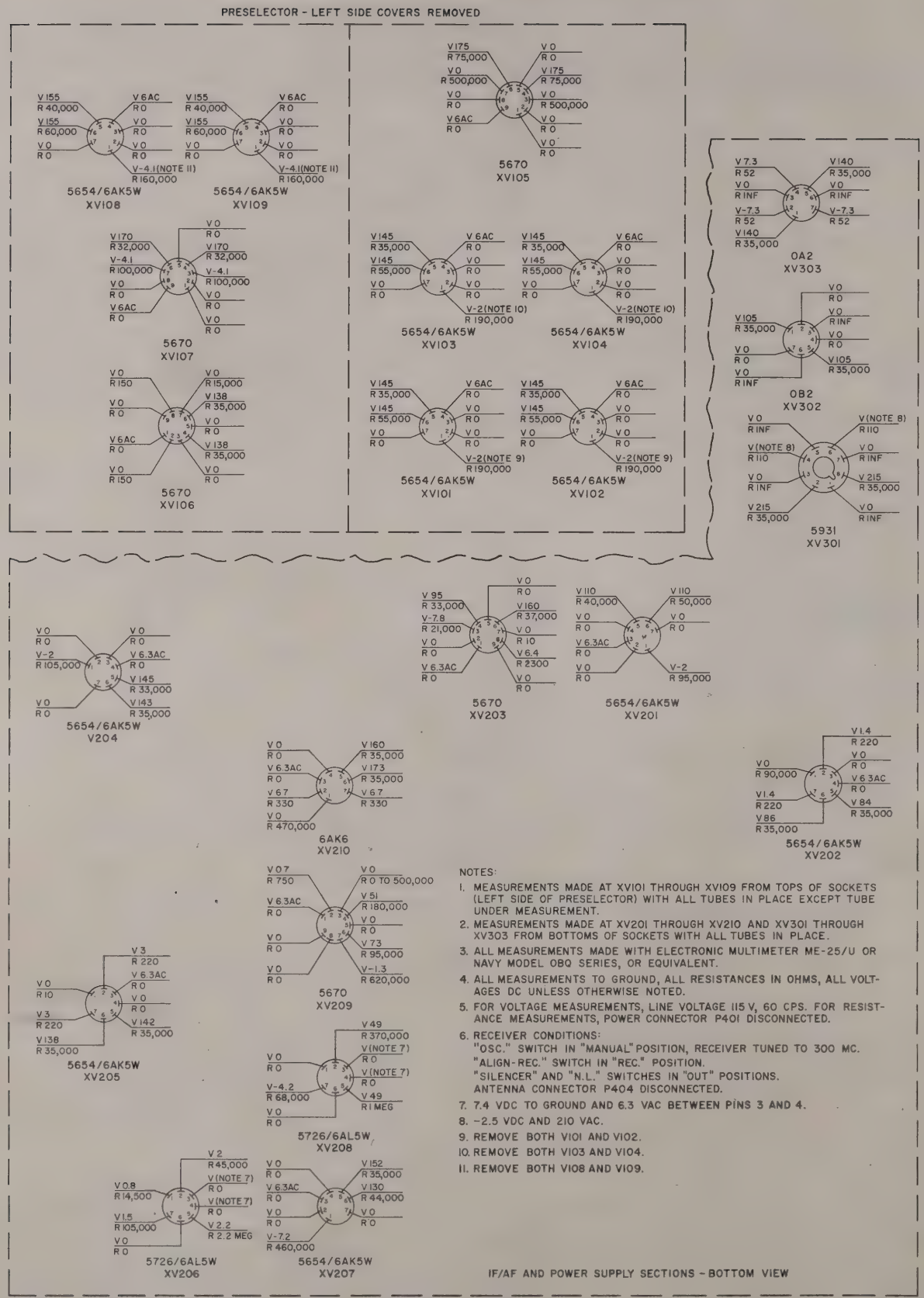
SYMPTOM	PROBABLE CAUSE	REMEDY
13. No-signal indication on OUTPUT meter; normal audio output.	13. Defective part in meter circuit.	13. Check meter M502 and associated chokes and capacitors; replace defective part.
14. Audio output distorted.	14. *a.* Same as item 12*a*. *b.* Defective a-f filter or coupling capacitor; open grid-leak resistor. *c.* AGC circuit defective.	14. *a.* Same as item 12*a*. *b.* Check voltages and resistances; replace defective part. *c.* Check V207 and V208; replace defective tube. Check voltages and resistances at all stages connected to AGC line and check all parts; replace defective parts.
15. Excessive hum in audio output.	15. *a.* Defective filter capacitor in power supply. *b.* Audio grid return open. *c.* Defective tube. *d.* Heater-bias circuit defective.	15. *a.* Replace C301, C302 and/or C303. *b.* Check grid resistors in a-f stages. *c.* Check V206 and V208 for heater-to-cathode leakage; replace if necessary. *d.* Check voltage and resistance at heaters of V206 and V208; replace defective part.
16. No audio output with N.L. switch in IN position.	16. *a.* Defective tube. *b.* Coupling capacitor shorted.	16. *a.* Replace V206. *b.* Replace C223.
17. Noise limiter does not limit noise impulses with N.L. switch in IN position.	17. *a.* Same as item 16. *b.* Defective part in limiter or detector circuit.	17. *a.* Same as item 16. *b.* Check voltages and resistances; replace defective part.

TABLE 7–2. I-F AND A-F TEST DATA

INPUT TEST POINT	*INPUT SIGNAL		**OUTPUT
	FREQUENCY	AMPLITUDE	
L111, adjusting screw	18.6 mc	21 uv	—4 v at J204
J101	18.6 mc	250 uv	—4 v at J204
V201, pin 1	18.6 mc	4 uv	10 db on OUTPUT meter
V203, pin 7	1.775 mc	95 uv	10 db on OUTPUT meter
J201	1.775 mc	43,000 uv	—4 v at J204
V204, pin 1	1.775 mc	530 uv	10 db on OUTPUT meter
V205, pin 1	1.775 mc	17,000 uv	10 db on OUTPUT meter
V209, pin 7	1000 cps	17 mv	10 db on OUTPUT meter
V209, pin 3	1000 cps	360 mv	10 db on OUTPUT meter
V210, pin 1	1000 cps	2 v	10 db on OUTPUT meter

* 18.6- and 1.755-mc input signals modulated 30 percent at 1000 cps and applied to input test point through 0.01-uf capacitor. (Capacitor not required at J101 and J201.) A-f test signal applied to input test point through 0.1-uf capacitor.

** Output obtained for following receiver conditions: OSC. switch in CRYSTAL position with no crystal installed in holder, ALIGN-REC. switch in REC. position, SILENCER switch in OUT position, N.L. switch in OUT position, A.F. LEVEL control fully clockwise with no audio load connected. Voltages at J204 measured with electronic multimeter (ME–25/U series, Navy Model OBQ series, or equivalent).



NOTES:

1. MEASUREMENTS MADE AT XV101 THROUGH XV109 FROM TOPS OF SOCKETS (LEFT SIDE OF PRESELECTOR) WITH ALL TUBES IN PLACE EXCEPT TUBE UNDER MEASUREMENT.
2. MEASUREMENTS MADE AT XV201 THROUGH XV210 AND XV301 THROUGH XV303 FROM BOTTOMS OF SOCKETS WITH ALL TUBES IN PLACE.
3. ALL MEASUREMENTS MADE WITH ELECTRONIC MULTIMETER ME-25/U OR NAVY MODEL OBQ SERIES, OR EQUIVALENT.
4. ALL MEASUREMENTS TO GROUND, ALL RESISTANCES IN OHMS, ALL VOLTAGES DC UNLESS OTHERWISE NOTED.
5. FOR VOLTAGE MEASUREMENTS, LINE VOLTAGE 115 V, 60 CPS. FOR RESISTANCE MEASUREMENTS, POWER CONNECTOR P401 DISCONNECTED.
6. RECEIVER CONDITIONS:
   "OSC." SWITCH IN "MANUAL" POSITION, RECEIVER TUNED TO 300 MC.
   "ALIGN-REC." SWITCH IN "REC." POSITION.
   "SILENCER" AND "N.L." SWITCHES IN "OUT" POSITIONS.
   ANTENNA CONNECTOR P404 DISCONNECTED.
7. 7.4 VDC TO GROUND AND 6.3 VAC BETWEEN PINS 3 AND 4.
8. -2.5 VDC AND 210 VAC.
9. REMOVE BOTH V101 AND V102.
10. REMOVE BOTH V103 AND V104.
11. REMOVE BOTH V108 AND V109.

Figure 7-1. Tube Socket Voltage and Resistance Measurements

c. VOLTAGE AND RESISTANCE MEASUREMENTS.—The values of voltage and resistance between the pin of each tube socket and ground for the IF/AF and power supply sections are indicated in figure 7–1. Similar readings at the tube sockets of the preselector are also included in figure 7–1. Because of the physical arrangement of the preselector in the receiver, these measurements must be made from the top of each preselector tube socket after removing the tube from the socket at which the measurements are to be made. Unless otherwise specified in figure 7–1, all other tubes should remain in place. Since tube-socket voltages obtained in that manner are not indicative of operating conditions, the actual operating voltages (and resistances) at other pertinent test points accessible on the preselector assembly are shown in figure 7–2. Similar values, measured at test jacks and from terminal-board terminals to ground and/or other significant points, are given in table 7–3.

The values specified in figures 7–1 and 7–2, and in table 7–3, were obtained by using an electronic multimeter such as Multimeter ME–25/U series, Vacuum Tube Volt-Ohm-Milliammeter Navy Model OBQ series, or equivalent. The conditions under which voltage and resistance measurements were made are as follows: 115-volt, 60-cps line voltage; receiver tuned to 300 megacycles; ALIGN-REC. switch in REC. position; SILENCER switch in OUT position and N.L. switch in OUT position. Resistance measurements were made with the power connector (P401) removed from the A.C. POWER receptacle (J401).

Values of voltage and resistance as measured in the equipment should be within ±20 percent of those specified in this instruction book.

d. ACCESS TO WIRING AND COMPONENTS.—To gain access to the wiring and components, release the four fasteners in the corners of the front panel and withdraw the chassis as far as the mechanical stops will permit. Then release the stops, as shown in figure 3–2, and remove the chassis from the cabinet.

e. OPERATION OF RECEIVER OUT OF CABINET.—If the receiver is to be operated after having been removed from the cabinet, either of the two following methods must be employed to connect the power cable and antenna transmission line to the chassis.

(1) If there is sufficient slack in the installation wiring to allow the cables to reach the receiver chassis in its test position, proceed as follows:

(*a*) Disconnect all external cables from the connectors on Low-Pass Filter F–218/URR–35 at the rear of the receiver.

(*b*) Disengage the snap-slide fasteners, shown in figure 3–3, which secure the filter housing to the cabinet and remove the filter through the front of the cabinet.

(*c*) Plug the filter into the connectors on the rear of the receiver chassis and reconnect the external cables to the connectors on the filter.

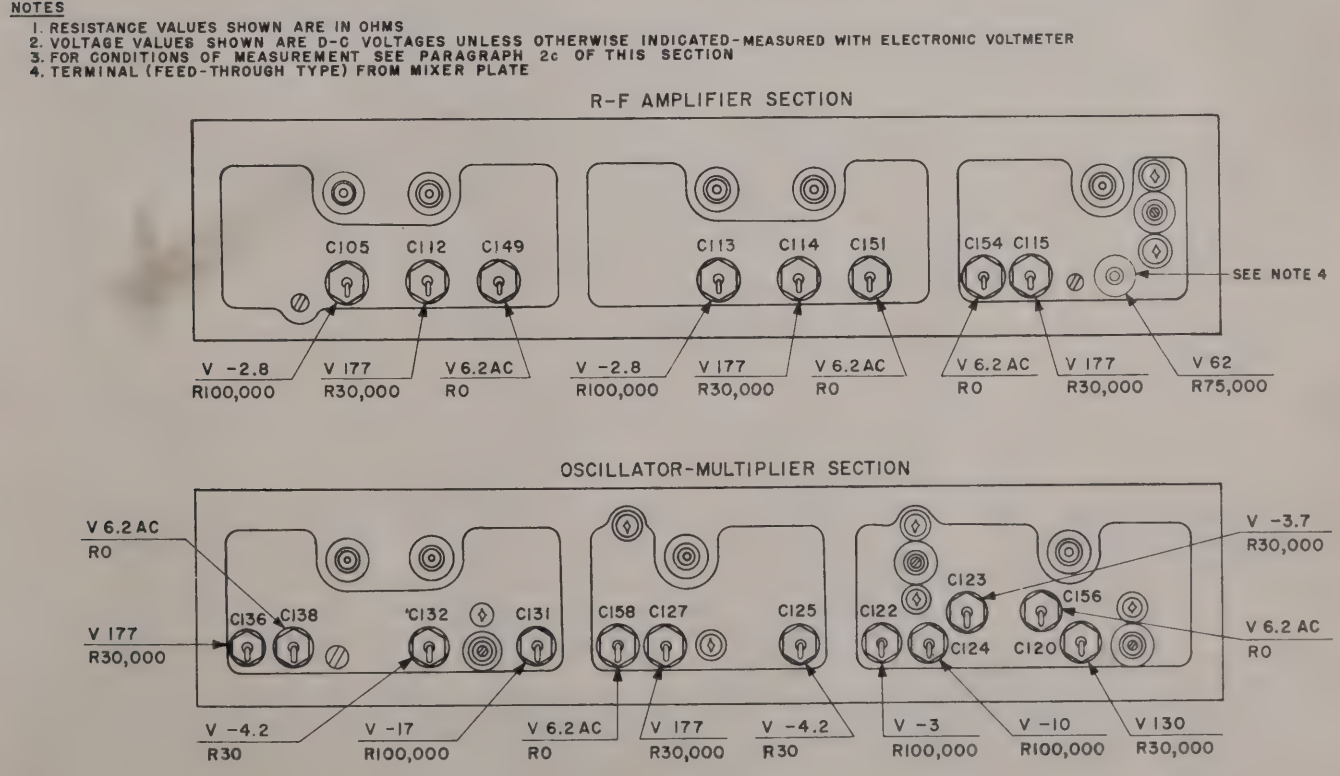


Figure 7–2. Preselector Voltage and Resistance Measurements

(2) Where installation wiring is too short to permit removal of the filter assembly, the test cable assemblies supplied should be used to complete the antenna, audio and power circuits between the filter and the receiver chassis; see figure 7–3. Receptacle J407, on the filter, and plug P101, on the receiver chassis, are interconnected by Radio Frequency Cable Assembly CG–839/U. Filter receptacle J405 and chassis connector P301 are interconnected by Electrical Power Cable Assembly CX–1869/U.

3. SENSITIVITY CHECK.

a. GENERAL.—The following procedure for checking the sensitivity of the receiver is provided so that the technician can determine whether or not realignment is necessary.

The procedure outlined is one which does not employ a signal generator, but instead, makes use of tube noise as an indication of sensitivity. This method has been selected because the frequency modulation inherent in most common types of signal generators operating in the 225–400 mc range makes the sensitivity appear to be greater than it actually is. The rated sensitivity of Radio Receiver R–482/URR–35 is better than 8 microvolts, in series with 50 ohms, for a 10-db signal-to-noise ratio when the carrier is 30-percent modulated with a 1000-cps tone. Checked with any ordinary signal generator, this sensitivity might appear to be better than 4 microvolts because of slope detection of the frequency-modulated test signal.

Note

If the sensitivity and gain measurements outlined in the following paragraphs appear normal, yet receiver performance is poor, it is possible that a "noisy" tube is causing a faulty indication of proper sensitivity. If so, the defective tube may be found by tapping each

TABLE 7–3. TEST-JACK AND TERMINAL-BOARD VOLTAGE AND RESISTANCE MEASUREMENTS

TEST JACK OR TERMINAL BOARD	TERMINAL	*D-C VOLTAGE TO GROUND	*RESISTANCE TO GROUND (OHMS)
Osc. test jack J202		−5.0	.....
Diode test jack J203		−1.7	.....
AGC test jack J204		−2.5	.....
180 V test jack J205		170	.....
Terminal board E303 (Power Supply Section)	1	.....	.....
	2 to 3	6.3 ac**	52
	3 to 2	6.3 ac**	52
	4	0	0
	5	6.3 ac	0
	6	−4.35	28
	7	173	35,000
	8	105	35,000
	9	.....	.....
	10	.....	.....
	11	.....	.....
	12	.....	.....
	13	−7.4	52
	14	.....	.....
	15	105	150,000
Terminal board E301 (Power Supply Section)	21	.....	0
	22	173	35,000
	23	139	35,000
	24	.....	.....
	25	0	0
	26	.....	.....
Terminal board E208 (IF/AF Section)	31	133	35,000
	32	.....	.....
	33	140	35,000
	34	−2.47	90,000
	35	−4.3	30
	36	−16.5	90,000

* Conditions for measurement: Line voltage 115 volts, 60 cps; ALIGN-REC. switch in REC. position; OSC. switch in MANUAL position; SILENCER and N.L. switches in OUT positions; receiver tuned to 300 mc with no signal. All measurements made with electronic multimeter (ME–25/U series, Navy Model OBQ series, or equivalent). Resistance measurements made with power cable disconnected at A.C. POWER receptacle (J401).

** Voltage measured between terminals 2 and 3.

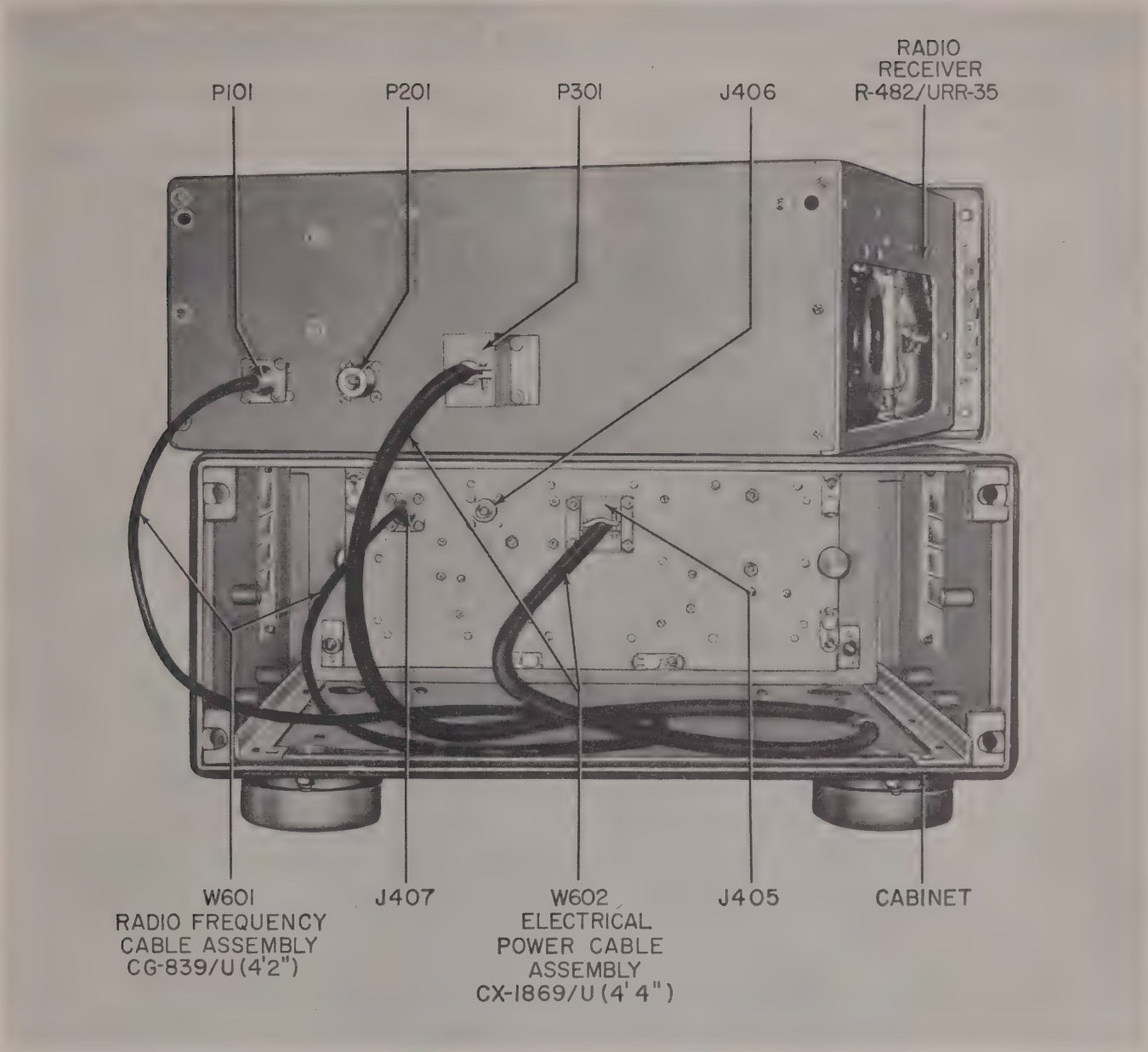


Figure 7–3. Use of Test Cables

tube successively while listening to a headset; in nearly all instances, "noisy" tubes are also microphonic. Repeat the sensitivity test after replacing the defective tube or tubes.

b. OVER-ALL SENSITIVITY.

(1) The conditions for making this test are as follows:

(*a*) OSC. switch S203 (in left compartment) in MANUAL position.

(*b*) N.L. switch S202 (in right compartment) in OUT position.

(*c*) SILENCER switch S501 in OUT position.

(*d*) A.F. LEVEL screwdriver-adjust control R255 (in right compartment) turned fully clockwise.

(*e*) ALIGN-REC. switch S201 (in left compartment) in REC. position.

(*f*) Antenna input connector P404 disconnected from 50 OHM ANT. receptacle J404.

(*g*) 115-volt, 60-cps line voltage connected at A.C. POWER receptacle J401 and receiver POWER switch in ON position.

(2) Rotate the tuning control through its entire range and note the readings indicated on OUTPUT meter M502. The meter readings should not change more than 5 db over the tuning range, and the average reading should be $+11 \pm 5$ db.

c. MEASUREMENT OF GAIN.—To determine whether the gain of the preselector and the IF/AF

stages is adequate for normal sensitivity, proceed as follows:

(1) IF/AF GAIN MEASUREMENT.

(*a*) Set all controls as in paragraph 3*b*(1), this section, except for OSC. switch S203, which should be set in the CRYSTAL position with *no* crystal inserted.

(*b*) Observe the reading on OUTPUT meter M502. If this is greater than —10 db, the IF/AF gain is satisfactory, and the gain of the preselector should next be checked. If the reading is below —10 db, then all tubes (V201 to V210) in the IF/AF chassis should be tested and those found to be weak or defective replaced. If all the tubes are normal, the i-f stages should be realigned according to the procedure given in paragraph 4*c* of this section.

(2) PRESELECTOR GAIN MEASUREMENT.

(*a*) Set all controls as in paragraph 3*b*(1), this section (OSC. switch in MANUAL position).

(*b*) Rotate the tuning control back and forth through the frequency range and lock it in the position at which the reading indicated on OUTPUT meter M502 is lowest.

(*c*) If this minimum reading is at least 1 db higher than the reading obtained when measuring IF/AF gain, in paragraph 3*c*(1)(*b*) above, the preselector gain is acceptable.

(*d*) If the reading is not 1 db higher, the voltage between the adjusting screw of L111 (see figure 7–10) and ground should be measured with a d-c electronic voltmeter, first with OSC. switch S203 in the CRYSTAL position (with no crystal inserted), then with the switch in the MANUAL position. If the potential thus measured is at least 0.2 volt more negative with the switch in the MANUAL position, the oscillator-multiplier section of the preselector is operating properly, and the next step should be the testing of the tubes (V101 to V105) in the r-f section. If the potential measured is not 0.2 volt more negative, then the tubes (V106 to V109) in the oscillator-multiplier section should be checked.

(*e*) If all tubes (V101 to V109) in the preselector are normal, r-f alignment should be undertaken according to the procedure given in paragraph 4*f* (or 4*g*) of this section.

4. ALIGNMENT PROCEDURES.

a. EQUIPMENT REQUIRED. — The following equipment is required for proper alignment of the r-f and i-f stages of Radio Receiver R–482/URR–35:

(1) RF Signal Generator AN/URM–25 series, Navy Model LP series, or equivalent signal generator having output impedance of 50 ohms.

(2) RF Signal Generator Navy Model LAF series, or equivalent.

(3) Multimeter ME–25/U series, Vacuum Tube Volt-Ohm-Milliammeter Navy Model OBQ series, or equivalent.

(4) Insulated alignment tool H501 and alignment loading tool H502, both mounted in clips on receiver chassis; see figure 7–5.

b. PREPARATION OF RECEIVER FOR ALIGNMENT.

(1) Remove the receiver chassis from the cabinet and stand it on its right side.

(2) Make connections to Low-Pass Filter F–218/URR–35, following the applicable procedure in paragraph 2*e*, this section.

(3) Set the SILENCER and N.L. switches to their OUT positions.

WARNING

WHEN THE RECEIVER IS SET UP FOR BENCH TESTING, AND THE "POWER" SWITCH IS "OFF", DANGEROUS VOLTAGES ARE STILL PRESENT AT THE FOLLOWING POINTS:

CONNECTOR P301 AT THE REAR OF THE RECEIVER CHASSIS; SEE FIGURE 7–3.

FUSE HOLDERS XF201 AND XF202 AT THE RIGHT SIDE OF THE FRONT SUBPANEL; SEE FIGURE 7–5.

TERMINALS 9 AND 10 ON POWER SUPPLY TERMINAL BOARD E303; SEE FIGURE 7–14.

c. ALIGNMENT OF I-F SECTION. (*See figure 7–4.*)

(1) Connect the output of RF Signal Generator AN/URM–25, or Navy Model LP, or equivalent, to 18.6-mc test jack J101 (see figure 7–5). Use type RG–58/U cable for connections.

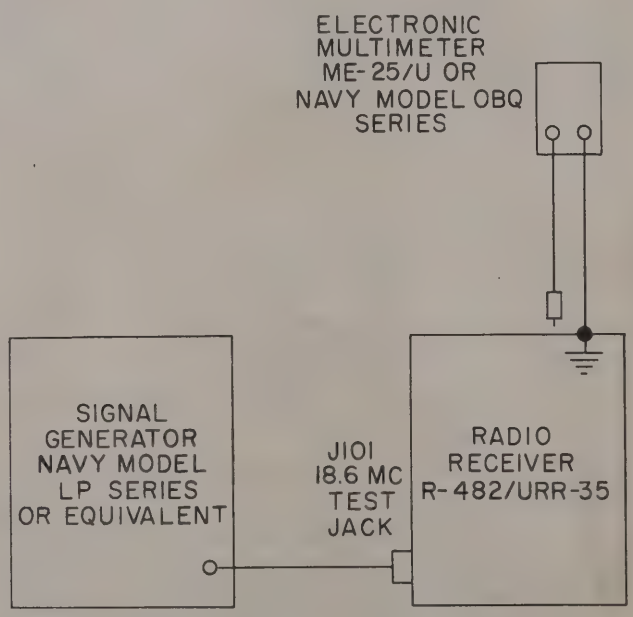


Figure 7–4. Bench Test Set-Up for I-F Alignment

(2) Tune the receiver to 218 megacycles, remove the type CR–24/U crystal from the CRYSTAL holder, set the OSC. switch to CRYSTAL and place the ALIGN-REC. switch in the REC. position.

(3) Set the POWER switch to its ON position and allow the receiver to warm up for about five minutes.

(4) Adjust the signal generator for 30 percent modulation at 1000 cps, and tune it to 18,602 kc.

Note

Refer to figures 7–5 and 7–6 for the locations of test jacks, i-f transformers and their terminals, and controls, as well as for the use and location of alignment tool H502.

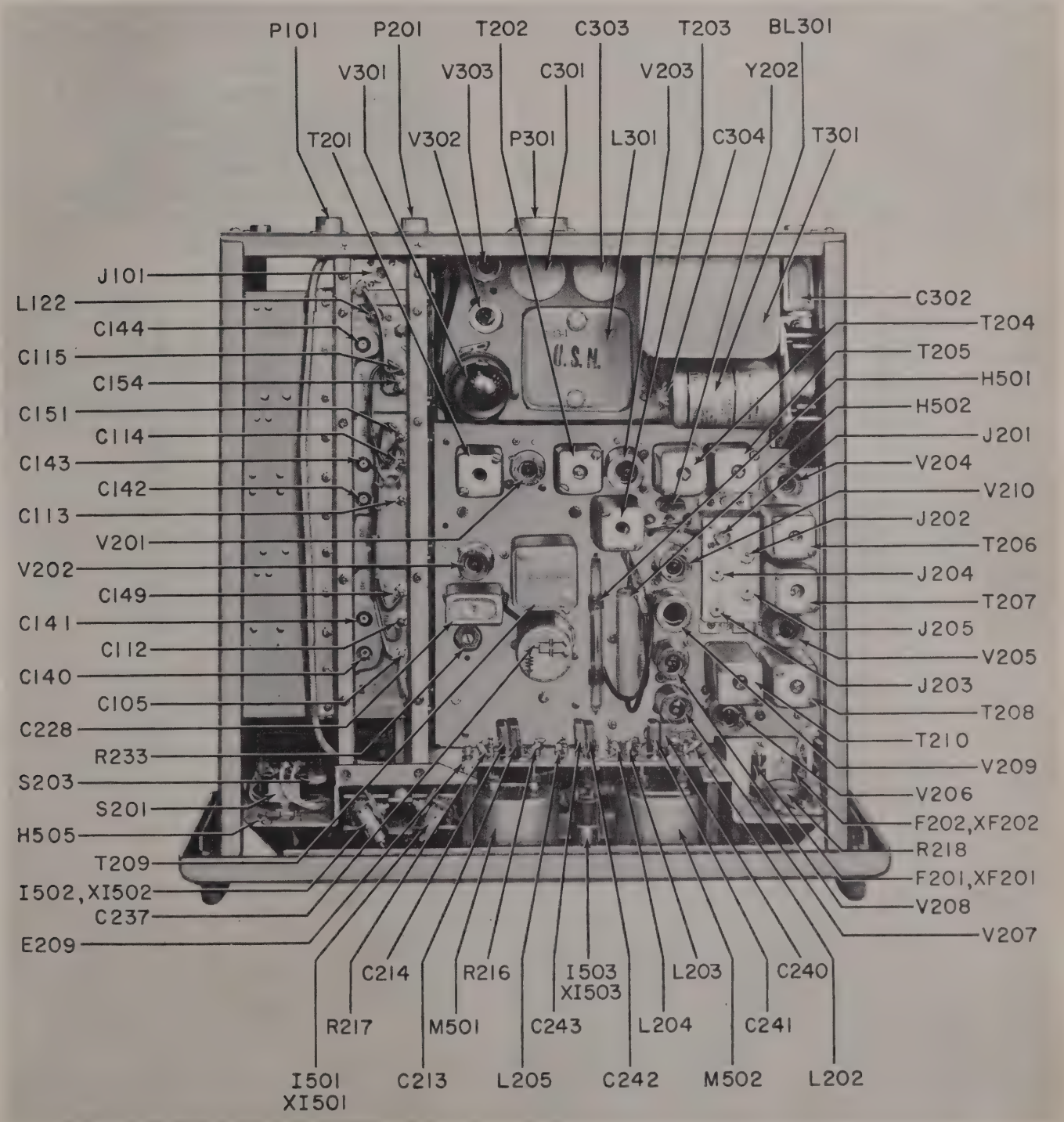


Figure 7–5. Radio Receiver R–482/URR–35, Top View—Identification of Components

(5) Connect the electronic multimeter between AGC test jack J204 and ground.

(6) Adjust the signal generator output for a reading of —3 volts on the electronic multimeter.

(7) Turn I.F. GAIN control R233 fully clockwise.

(8) Connect the electronic multimeter between oscillator test jack J202 and ground. Adjust transformer T203 for a meter indication of —5 volts.

Note

It is possible to mistune transformer T203, since —5 volts is neither a maximum nor a minimum reading. To ensure correct adjustment, first turn the adjusting screw fully counterclockwise. Then turn the adjusting screw clockwise until the first maximum is reached. Turn the screw counterclockwise until a reading of —5 volts is obtained on the multimeter.

(9) Reconnect the electronic multimeter between test jack J204 and ground.

(10) Tune transformer T210 for a maximum indication on the electronic multimeter.

(11) Ground the alligator clip of the alignment loading tool (H502) and set the notch of the hooked probe against terminal 4 of transformer T208. Tune the secondary of transformer T208 for maximum indication on the electronic multimeter by turning the adjusting screw on the bottom of the transformer.

Note

The alignment loading tool reduces the Q of tuned circuits. In order to avoid misadjustment of double-tuned transformers because of mutual inductance between the windings, it is necessary to load the transformer primary when tuning the secondary, and to load the secondary when tuning the primary.

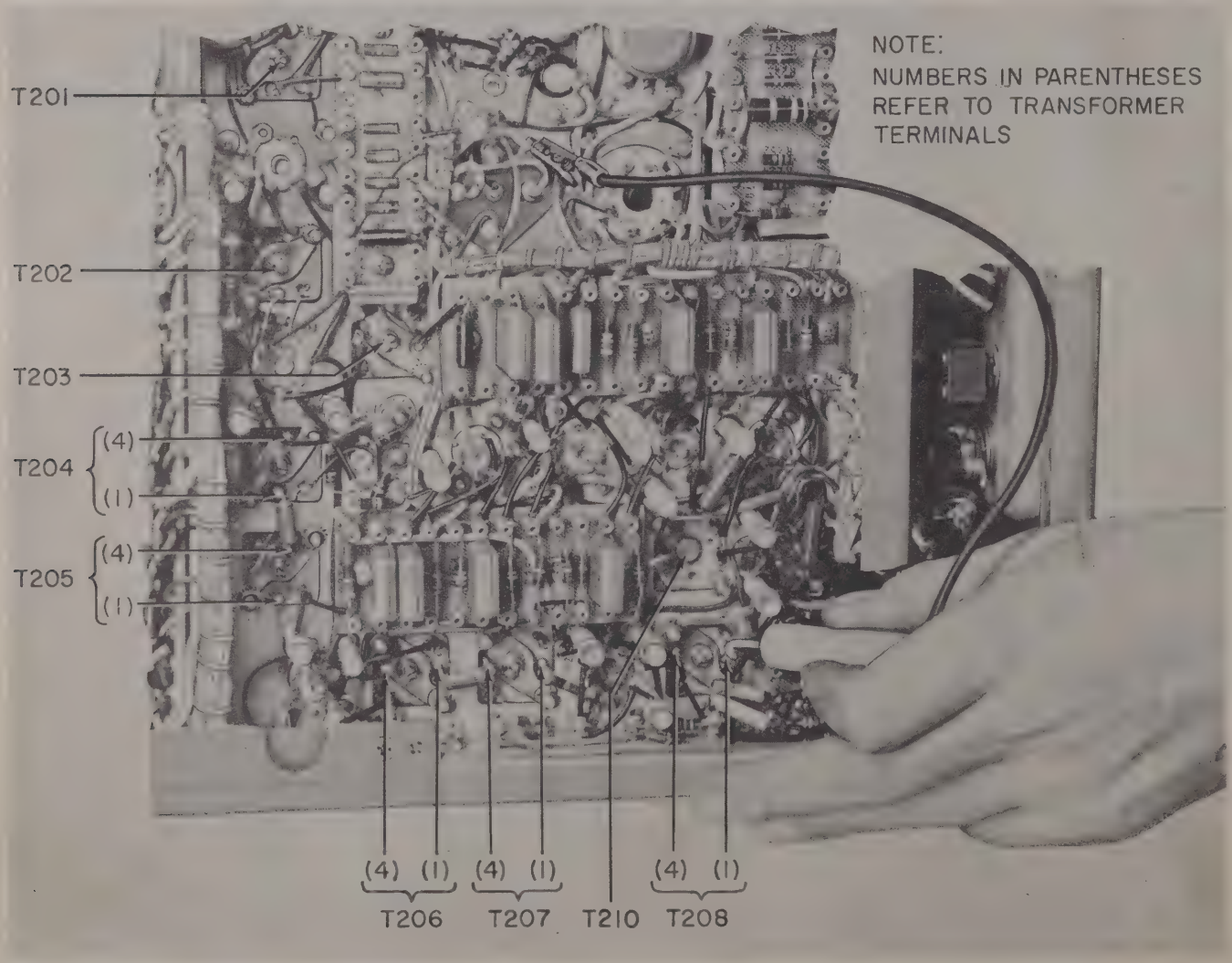


Figure 7–6. Use of Alignment Loading Tool and Identification of I-F Transformers

(12) Place the notch of the alignment loading tool on terminal 1 of transformer T208 and tune the primary by turning the adjusting screw at the top of the transformer for maximum indication on the electronic multimeter.

(13) Repeat steps (11) and (12) at transformers T207, T206, T205 and T204, in that order.

Note

While aligning these transformers, reduce the output of the signal generator in order to maintain an indication of approximately —3 volts at the electronic multimeter. This will prevent the development of a strong AGC signal, which might result in mistuning the i-f stages.

(14) Tune the secondary of transformer T202 for maximum indication on the electronic multimeter by turning the adjusting screw at the bottom of the transformer.

(15) Tune the primary of transformer T202 for maximum indication on the electronic multimeter by turning the adjusting screw at the top of the transformer.

(16) Tune the secondary of transformer T201 for maximum indication on the electronic multimeter by turning the adjusting screw at the bottom of the transformer.

(17) Tune the first mixer plate inductance, L122 (located at the top of the preselector, as shown in figure 7–11) for maximum indication on the electronic multimeter.

(18) Repeat steps (10) through (17) until no changes in alignment occur. The over-all i-f selectivity curve appears in figure 7–7.

d. ALIGNMENT OF AGC TRANSFORMER T210. (*See figure 7–4.*)

(1) Perform steps (1) through (5) of paragraph 4*c*, this section.

(2) Turn the output control of the signal generator to zero and note the AGC voltage, as indicated on the electronic multimeter. Increase the signal generator output until the AGC voltage just starts to increase.

(3) Connect the electronic multimeter between detector test jack J203 (see figure 7–5) and ground.

(4) Tune transformer T210 (see figure 7–5) for *minimum* indication on the electronic multimeter.

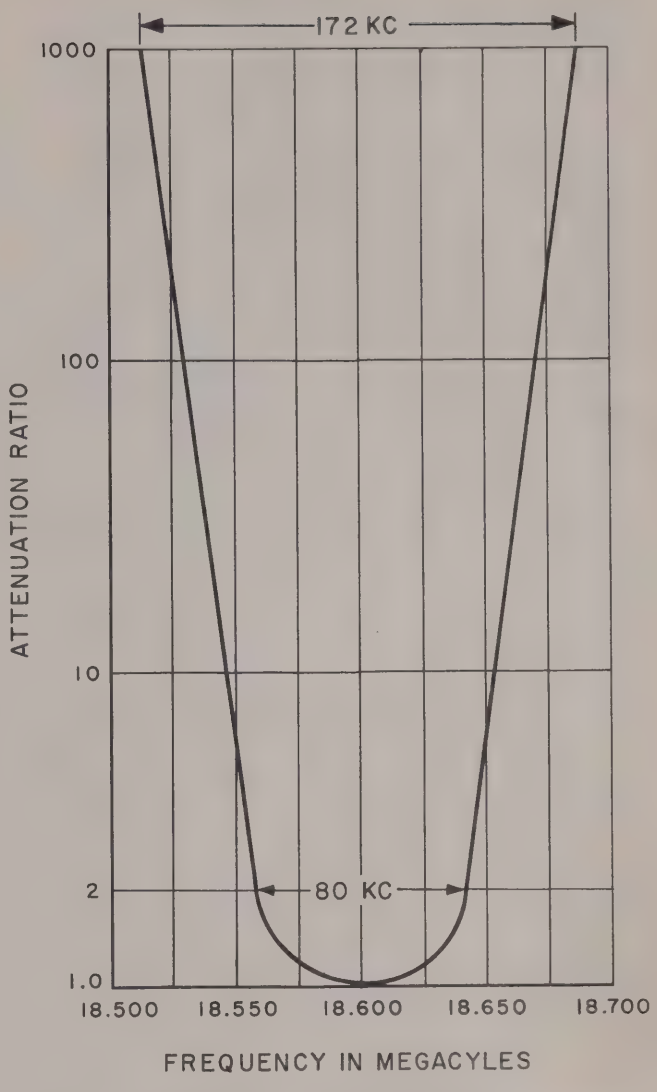


Figure 7–7. Typical I-F Selectivity Characteristic

e. I-F GAIN ADJUSTMENT.

(1) Connect the electronic multimeter between AGC test jack J204 (see figure 7–5) and ground.

(2) Set the OSC. switch to its MANUAL position.

(3) Tune the receiver throughout its entire range to find the lowest AGC voltage as indicated by the electronic multimeter.

(4) If the AGC voltage on the electronic multimeter is other than —2.3 volts, adjust it to that value by means of I.F. GAIN control R233, shown in figure 7–5. If it is not possible to adjust the AGC voltage to —2.3 volts, set it to the greatest negative voltage that can be obtained, which should be at least —2.0 volts. A maximum AGC voltage of less than —2.0 volts indicates a faulty receiver.

f. ALIGNMENT OF PRESELECTOR.
(*See figure 7–8.*)

WARNING

A D-C POTENTIAL OF 180 VOLTS IS PRESENT AT SOME OF THE INDUCTANCE AND CAPACITOR TRIMMER SCREWS AND AT SOME OF THE TRIMMER-INDUCTANCE LOCKING SCREWS. WHEN LOOSENING OR TIGHTENING THE LOCKING SCREWS BE CERTAIN THAT RECEIVER POWER IS OFF. USE THE INSULATED ALIGNMENT TOOL (H501, FIGURE 7–5) FOR ALL SPLINED TRIMMER-SCREW ADJUSTMENTS.

(1) De-energize the receiver and remove the shielding covers from the preselector. Loosen the locking screws on trimmer inductances L103, L104, L107, L108, L111 and L112 (see figures 7–9 and 7–10) about one-eighth of a turn, using the Bristol wrench (H505, figure 7–5) mounted near the dial-drive assembly. Replace the shielding covers.

(2) Connect the output of RF Signal Generator Navy Model LAF, or equivalent, to the 50 OHM ANT. input connector (J404) on the low-pass filter. Adjust the output attenuator of the signal generator for minimum output.

(3) Install a crystal, in the receiver CRYSTAL holder, which corresponds to some channel frequency between 230 and 234 megacycles, as determined by the formula:

$$\text{Crystal frequency (mc)} = \frac{\text{Selected channel frequency (mc)} + 18.6 \text{ mc}}{12}$$

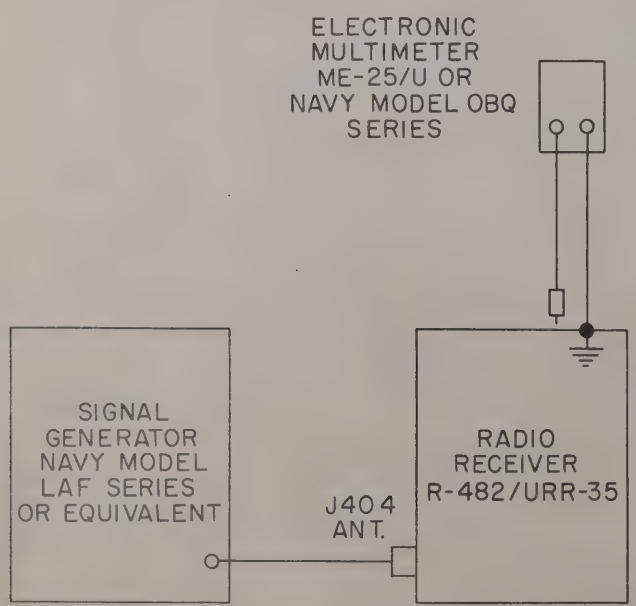


Figure 7–8. Bench Test Set-Up for R-F Alignment

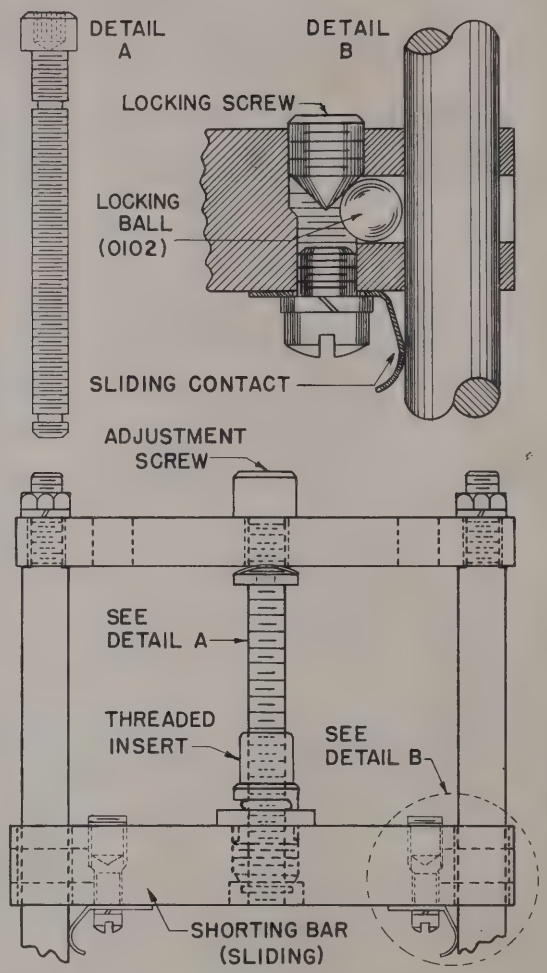


Figure 7–9. Details of Trimmer Inductances L103, L104, L107, L108, L111 and L112

Place the OSC. switch in its CRYSTAL position and tune the receiver to the channel frequency selected. Lock the tuning control.

Note

Refer to figures 7–10, 7–11 and 7–12 for locations of preselector tuning and adjustments and test points referenced in the following procedures.

(4) Connect the electronic multimeter between first-doubler-grid test point C122 and ground. Tune oscillator inductance L114 for maximum indication on the meter.

Note

The oscillator, second doubler and triplergrid adjustments, steps (4), (5), (6), (13), (14) and (15), may be made by setting the ALIGN-REC. switch to ALIGN and tuning for a maximum indication on the INPUT meter. Use of the electronic multimeter, however, is the preferable procedure.

(5) Place the probe of the electronic multimeter on second-doubler-grid test point C124 and tune second-doubler-grid inductance L115 for a maximum meter reading.

(6) Place the probe of the electronic multimeter on tripler-grid test point C131 and tune tripler-grid inductance L117 for a maximum meter reading.

(7) Place the probe of the electronic multimeter on the trimmer screw of mixer-grid inductance L111 and tune tripler-plate inductance L112 for a maximum meter reading.

(8) Connect the electronic multimeter between AGC test jack J204 and ground; see figure 7–5.

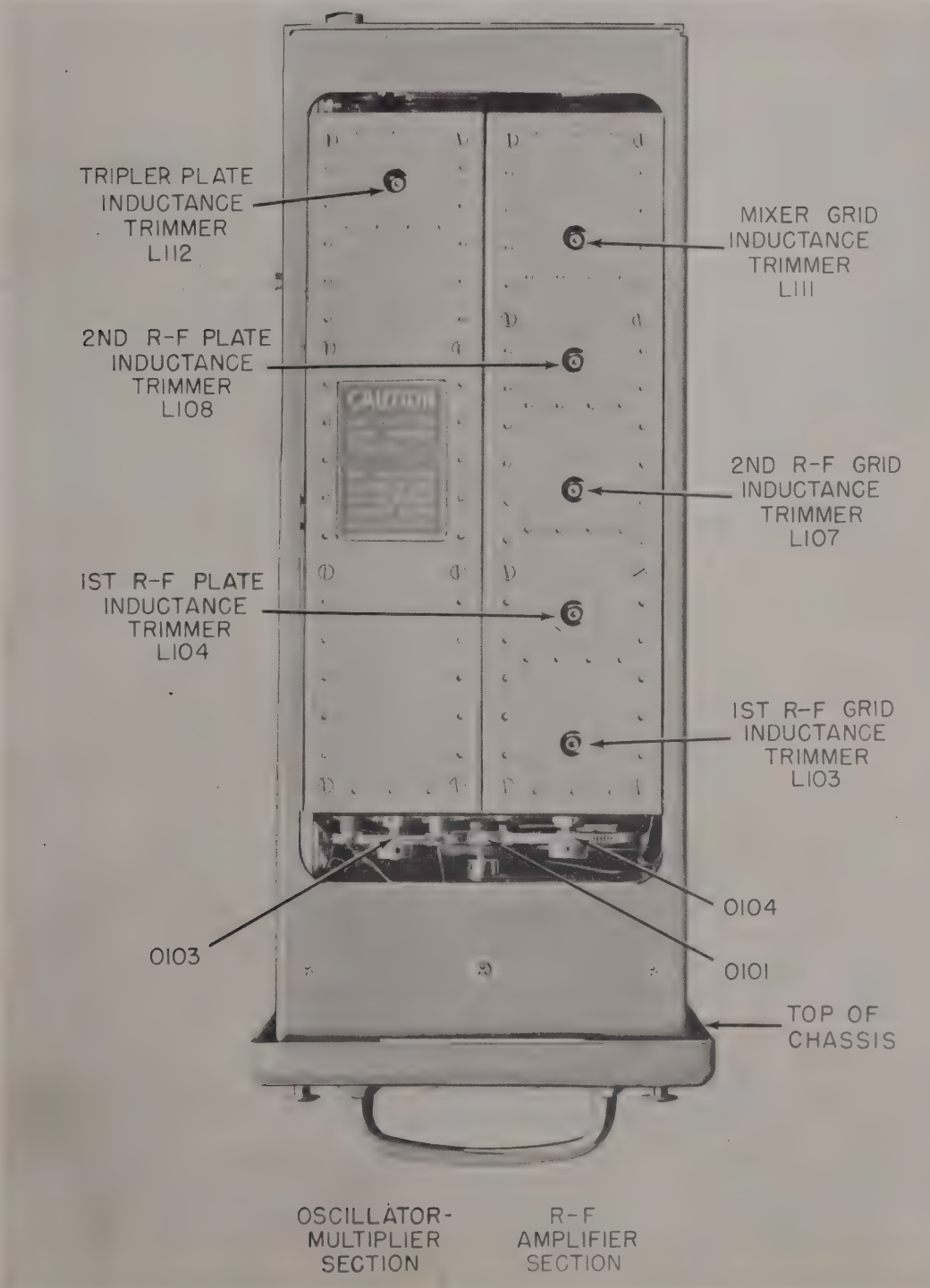


Figure 7–10. Preselector Viewed from Left Side of Chassis, Showing Alignment Adjusting Screws

Note

The adjustments in steps (9), (10), (11), (18), (19), and (20) may also be made by using the INPUT meter (M501), with the ALIGN-REC. switch in the REC. position, instead of an electronic multimeter, for tuning indication.

(9) With its modulation off, tune the signal generator for a maximum reading on the meter. The output attenuator should then be adjusted to give a reading of approximately 4 volts on the multimeter (0.4 on the INPUT meter).

(10) Using the alignment tool (H501), tune the r-f amplifier and mixer inductance trimmer screws for maximum meter readings, in the following order:

(*a*) Mixer-grid inductance L111.

(*b*) Second r-f plate inductance L108.

(*c*) Second r-f grid inductance L107.

(*d*) First r-f plate inductance L104.

(*e*) First r-f grid inductance L103.

While tuning, reduce the output of the signal generator as necessary to keep the electronic multimeter reading at approximately 4 volts (0.4 on the INPUT meter).

(11) Set the OSC. switch to MANUAL. Notice that when this is done, the electronic multimeter reading may drop to about 2 volts (0.2 on the INPUT meter). Now tune oscillator inductance L114 until the meter reading is a maximum.

(12) Set the OSC. switch to CRYSTAL, install a crystal corresponding to some channel frequency between 391 and 395 mc, set the tuning dial to the crystal channel selected, and lock the tuning dial.

(13) Place the probe of the electronic multimeter on first-doubler-grid test point C122 and tune oscillator trimmer capacitor C148 for a maximum meter reading.

Note

In tuning the trimmer capacitors, a slight amount of capacitance is added to the circuit by the presence of the alignment tool. It is therefore necessary to compensate for this capacitance by tuning the trimmers slightly beyond maximum, in a clockwise direction, so that the electronic multimeter will read a maximum when the alignment tool is removed from the trimmer screw.

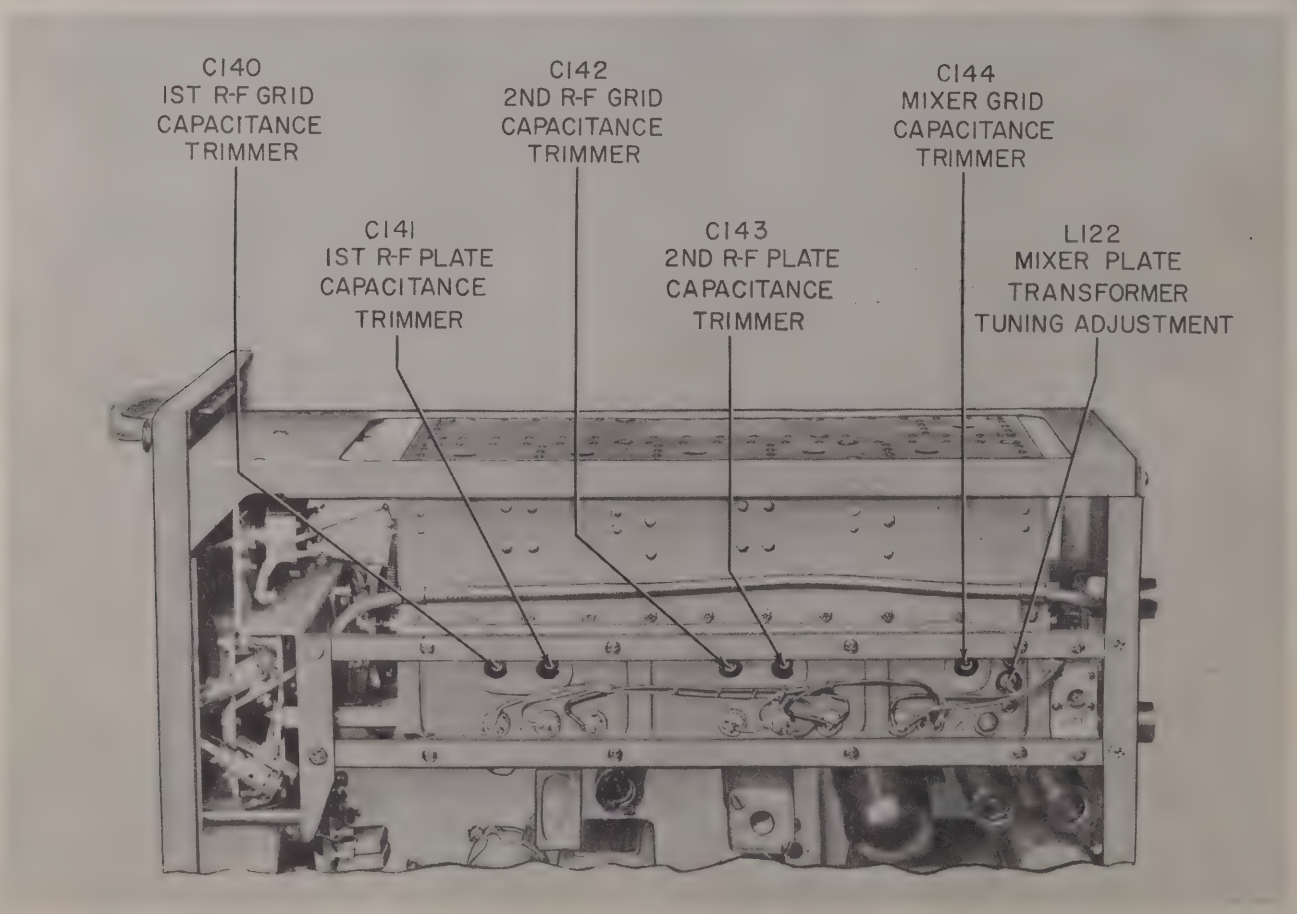


Figure 7–11. Preselector Viewed from Top Side of Chassis, Showing Alignment Adjusting Screws

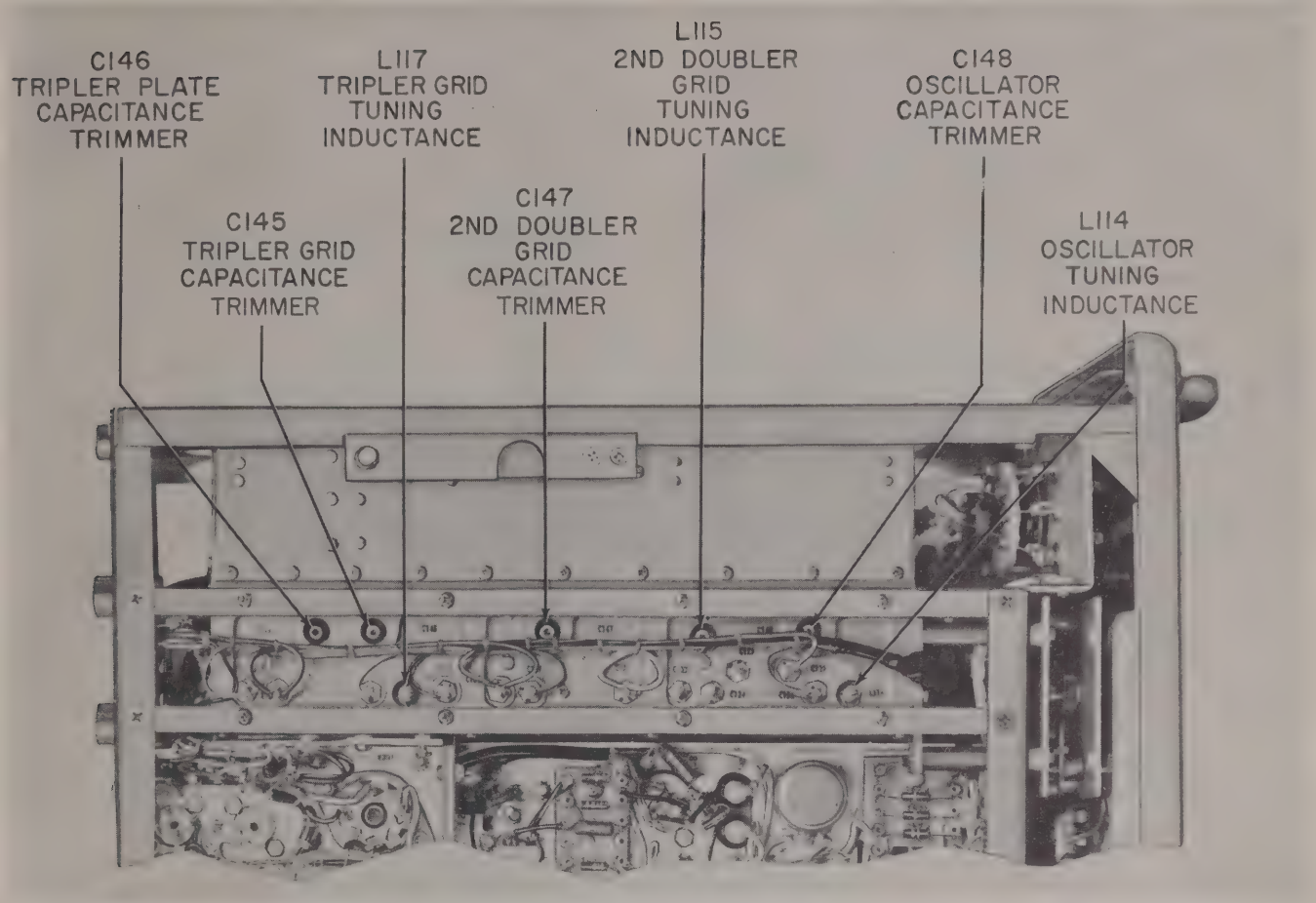


Figure 7–12. Preselector Viewed from Bottom Side of Chassis, Showing Alignment Adjusting Screws

(14) Place the probe of the electronic multimeter on second-doubler-grid test point C124 and tune second-doubler-grid trimmer capacitor C147 for a maximum meter reading.

(15) Place the probe of the electronic multimeter on tripler-grid test point C131 and tune tripler-grid trimmer capacitor C145 for a maximum meter reading.

(16) Place the probe of the electronic multimeter on the trimmer screw of mixer-grid inductance L111 and tune tripler-plate trimmer capacitor C146 for a maximum meter reading.

(17) Connect the electronic multimeter between AGC test jack J204 and ground; see figure 7–5.

(18) Tune the signal generator for a maximum reading on the meter. The output attenuator of the signal generator should then be adjusted to give a reading of approximately 4 volts on the electronic multimeter (0.4 on the INPUT meter).

(19) Using the alignment tool (H501), tune the r-f amplifier and mixer trimmer capacitors for a maximum reading on the electronic multimeter, in the following order:

(*a*) Mixer-grid capacitor C144.

(*b*) Second r-f plate capacitor C143.

(*c*) Second r-f grid capacitor C142.

(*d*) First plate capacitor C141.

(*e*) First r-f grid capacitor C140.

(20) Set the OSC. switch to MANUAL. Note that when this is done, the electronic multimeter reading may drop to about 2 volts (0.2 on INPUT meter). Now tune oscillator trimmer capacitor C148 until the meter reading is a maximum; refer to the note following step (13).

(21) Repeat steps (4) through (20) until no further adjustment of the trimmer capacitors is necessary to align the high-frequency alignment point.

Note

Always terminate alignment by aligning the preselector at the high-frequency alignment point.

(22) After alignment of the preselector de-energize the receiver and remove the preselector shielding covers. Tighten the trimmer-inductance locking screws carefully, so that the adjustments will not be disturbed.

(23) Check the alignment of the receiver by making the sensitivity and gain measurements outlined in paragraph 3 of this section.

g. ALIGNMENT OF PRESELECTOR IF ALIGNMENT-POINT CRYSTALS ARE NOT AVAILABLE.—The following procedure must be used if crystals which will tune the receiver to the required alignment frequencies are not available. This procedure describes a different method of aligning the oscillator stage only. Alignment of the other stages of the preselector remains as described in paragraph 4*f*, above.

(1) Set up, near the receiver, a heterodyne frequency meter such as a Navy Model LM or LR series, which will cover the range of 10–18 megacycles, or the range 20–35 megacycles, and couple it, through a d-c blocking capacitor, to capacitor C123, located on the oscillator side of the preselector; see figure 7–15.

(2) Set the tuning dial of the receiver to 232 megacycles, throw the CRYSTAL-MANUAL switch to MANUAL, and install any crystal.

Note

The frequency of the crystal used in this case is immaterial, but a crystal of some frequency must be in the crystal holder during MANUAL operation because of capacity effects.

(3) Tune the frequency meter to 20,883 or 10,441.5 kilocycles.

(4) Tune oscillator inductance L114 until it is adjusted as near as possible to zero beat in the frequency-meter headphones.

(5) Proceed with steps (5) through (10), inclusive, of paragraph 4*f*, this section.

(6) Set the tuning dial of the receiver to 393 megacycles.

(7) Tune the frequency meter to 34,300 or 17,150 kilocycles.

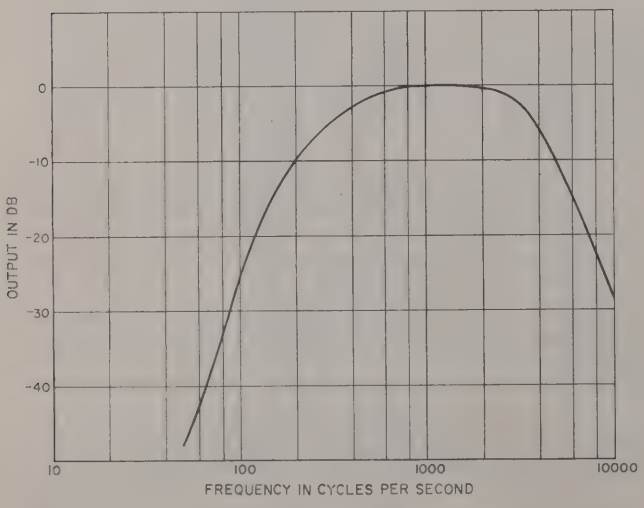


Figure 7–13. Typical Audio Response Characteristic

(8) Tune oscillator trimmer capacitor C148 until it is adjusted as near as possible to zero beat in the frequency-meter headphones.

(9) Proceed with steps (14) through (19) and steps (21) through (23) of paragraph 4*f*, this section. When repeating the alignment, in accordance with the instructions of step (21), do not perform steps (4), (11), (12), (13) and (20).

5. AUDIO-FREQUENCY RESPONSE.

The audio-frequency response characteristic for Radio Receiver R–482/URR–35 appears in figure 7–13. Since there are no adjustments in the a-f stages of the receiver, any significant variation from the response curve must indicate a defective circuit or component.

6. REPAIR AND REPLACEMENT OF PARTS.

a. GENERAL.—The repair and replacement of most of the parts of Radio Receiver R–482/URR–35 is straightforward, involving only the removal of mounting hardware and the unsoldering of connecting wires. However, the procedures in this paragraph are included for the parts specified because the parts are so located that special precautions must be taken, and/or preferred repair procedures followed.

The locations of all components in the radio receiver are shown in figures 1–3, 2–2, 2–3, 3–3, 7–5, 7–14, 7–15, and 7–17 through 7–21.

b. BLOWER BL301.—Blower BL301 is located in the right rear corner of the chassis, as shown in figure 7–5. Its removal entails removal of the right side plate of the receiver chassis, and should be undertaken as follows:

(1) Take off the right side plate by removing:

(*a*) Four screws entering the side panel from the front panel.

(*b*) Three screws entering the side panel from the rear panel.

(*c*) Eight screws connecting the side panel to the chassis and to the front-panel subassembly.

(2) Disconnect the blower bracket from the power supply sub-panel by removal of three screws.

(3) Unsolder the incoming power lead at capacitor C304.

(4) Unsolder motor leads 1 and 4 from terminal board E302; see figures 7–14 and 7–30.

(5) Remove the subassembly comprising the blower, bracket and capacitor C304.

(6) If a new blower is to be installed in place of the one in the equipment, transfer the bracket and the capacitor to the new part and reverse the above procedure.

c. BLOWER CAPACITOR C304.—The blower capacitor is located underneath blower BL301 in the right rear corner of the chassis (see figure 7–5), and

is attached to the same bracket which supports the blower. If there is any reason to remove the blower at the same time, the capacitor can be removed by removing the blower and bracket as explained in paragraph 6*b* above, in which case it will be necessary merely to unbolt the old capacitor from the blower bracket and attach the new one. However, if there is no reason to remove the blower, access to the capacitor is more easily gained by first removing filter choke L301, located between the blower and rectifier tube V301, as follows:

(1) Unsolder the wires from the three terminals of choke L301; see figure 7–15.

(2) Remove the nuts from the four mounting studs on L301.

(3) Lift out L301.

(4) Unsolder the wires from two terminals of capacitor C304, atop the chassis.

(5) Remove the nuts from the two mounting studs on C304, which are accessible through holes in the right side panel of the chassis.

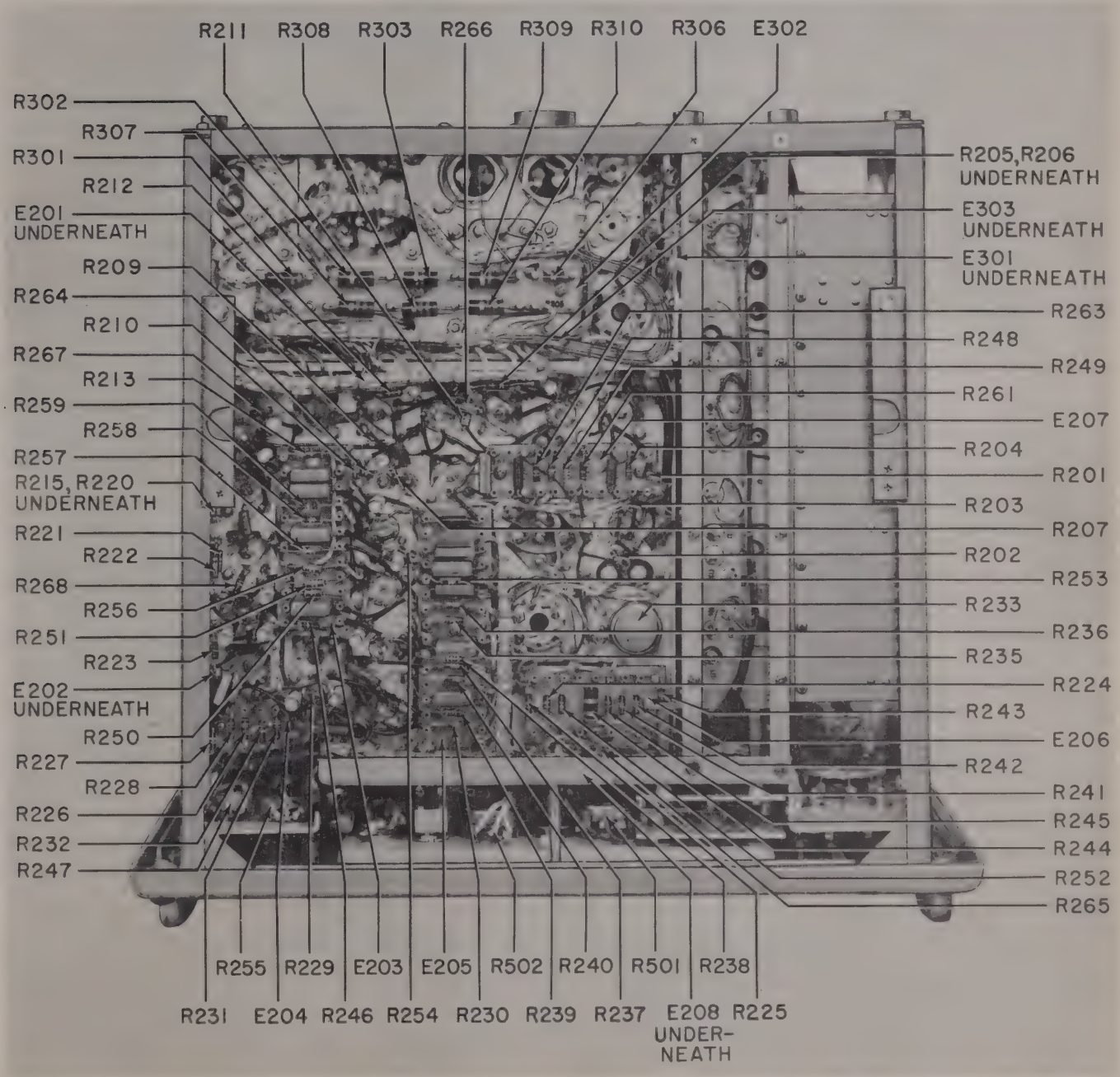


Figure 7–14. Radio Receiver R–482/URR–35, Bottom View—Identification of All Resistors and Terminal Boards

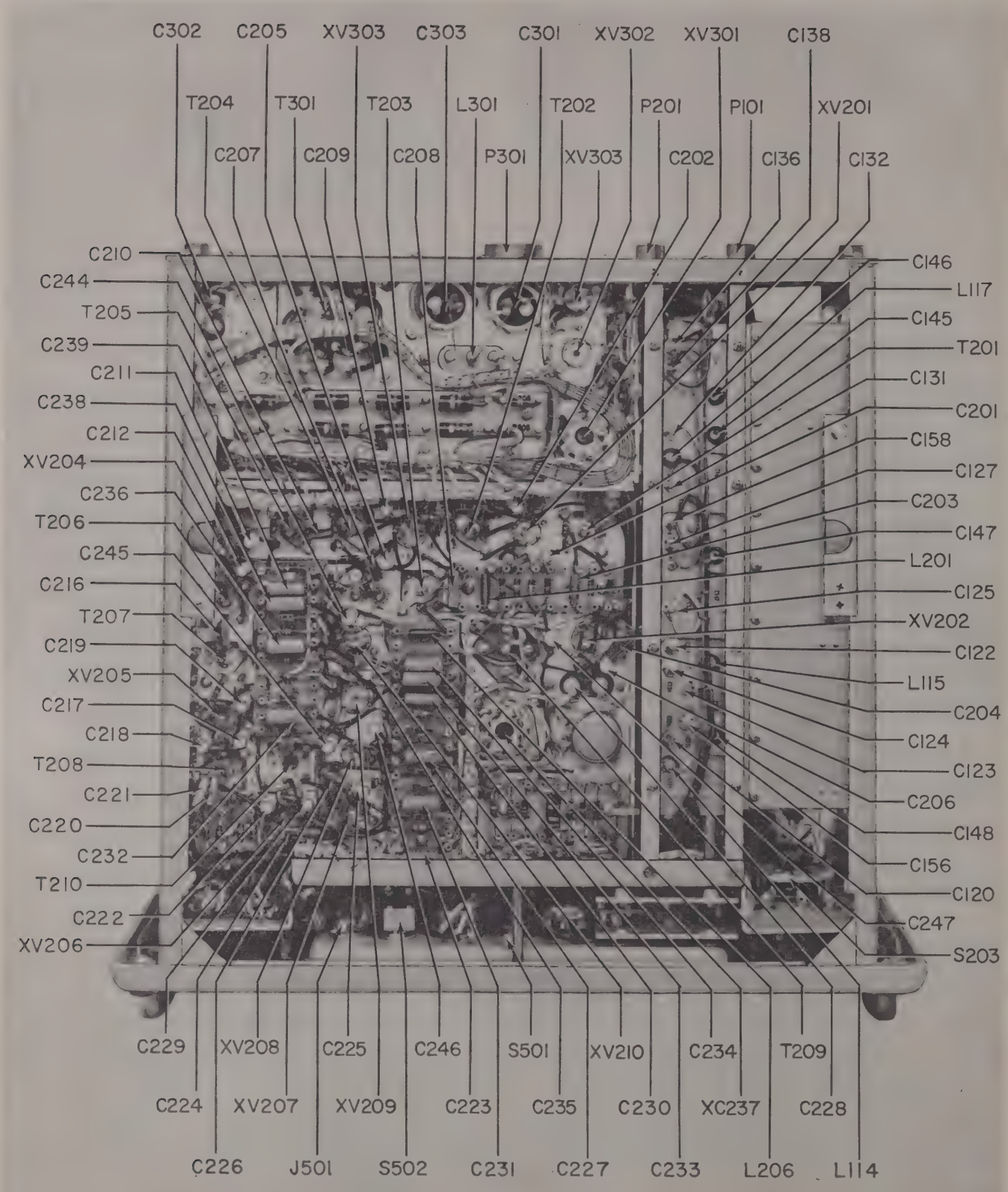


Figure 7–15. Radio Receiver R–482/URR–35, Bottom View—Identification of All Components Except Resistors and Terminal Boards

(6) Slip out capacitor C304.

(7) To install a new capacitor, reverse the above procedure, making sure that the leads to C304 and to L301 are connected to their proper respective terminals. If in doubt, consult the color-coding legend on the wiring diagram, figure 7–30.

d. BLOWER-MOTOR BEARINGS. — Radio Receiver R–482/URR–35 is supplied with one of three completely interchangeable types of blowers, all designated BL301. However, while the complete blower assemblies are interchangeable, the motor bearings employed in each are not. The following procedure, which covers the replacement of these bearings, is applicable to all three types of blowers unless otherwise stated; refer to figure 7–16 while disassembling and reassembling the blower.

(1) Remove the blower, in accordance with steps (1) through (5) of paragraph 6*b*, this section.

(2) Take off the molded impeller-wheel housing by removing the four screws and lockwashers which secure it to the backplate.

(3) Remove the impeller wheel from the motor shaft by inserting an Allen wrench between the blades of the wheel and loosening the two setscrews in the hub.

(4) Remove the armature as follows:

(*a*) For Eastern Air Devices Model J50–4C and Induction Motors Corporation Model BC–1615B–4, remove the retaining ring with a suitable pair of pliers ("Truarc" or equivalent). Withdraw the armature with its associated washers, being careful not to lose the dust cap.

(*b*) For Air-Marine Motors Model A15B–5, scribe a line across the motor housing and end bell to show proper alignment. Remove the end bell by removing the three tie bolts and lockwashers which secure it to the housing. Withdraw the armature with its associated washers.

(5) Remove the two ball bearings from the armature shaft, using a bearing puller.

(6) Fit new ball bearings on the shaft, using an arbor press or other suitable bearing installer tool. The proper bearings for each type of blower are tabulated below; the front bearing refers to that which is nearer the impeller wheel, while the rear bearing is that used at the closed end of the motor.

BLOWER MFR. AND MODEL	BEARING MFR., TYPE AND REF. SYMBOL	
	FRONT	REAR
Eastern Air Devices J50–4C	New Departure 77037 (O304)	New Departure 77R2 (O305)
Induction Motors Corp. BC–1615B–4	New Departure 77037 (O306)	New Departure 7034 (O307)
Air-Marine Motors A15B–5	Fafnir S1KDD (O308)	Fafnir 33KDD5–C1 (O309)

(7) Reassemble the blower in the reverse sequence of disassembly. Be certain that the dust cap removed in step (4)(*a*) is properly positioned at the end of the motor.

(8) Replace the blower on the receiver chassis, reversing the procedure specified in paragraph 6*b*, this section.

e. POWER TRANSFORMER T301.—Power transformer T301 is located in the right rear corner of the chassis immediately behind blower BL301; see figure 7–5. Its removal entails unfastening the rear panel of the chassis and separating it from the chassis far enough to provide an additional half-inch clearance above the transformer. To accomplish this, proceed as follows:

(1) Unsolder the wiring from the terminals of T301; see figure 7–15. Identify each wire in some manner if there is any likelihood that the preformed arrangement of these wires will be disturbed before connections are restored.

(2) Remove the nuts from the four transformer-mounting studs.

(3) Unfasten the rear panel by removing:

(*a*) Three screws connecting the rear panel to the left side panel.

(*b*) Three screws connecting the rear panel to the right side panel.

(*c*) Three screws (horizontal row) connecting the rear panel to the bed of the chassis.

(4) Pull the rear panel away from the chassis far enough to permit removal of transformer T301, but no farther, as excessive displacement will place a strain on the leads to connectors P101 and P201, and to thermostatic switch S301.

(5) To restore the original transformer, or to substitute a replacement for it, reverse the foregoing procedure, making sure that all transformer leads are reconnected to the proper respective terminals. If the leads have become mixed, consult the color-coding legend on the wiring diagram, figure 7–30.

f. DIAL-DRIVE ASSEMBLY.—The dial-drive assembly is located between the front panel and the front sub-panel of the receiver, as shown in figure 7–5. It is further illustrated in figure 6–1. To remove this assembly, it is necessary to remove the entire front panel, in accordance with the following procedure.

(1) Remove the tuning knob and the knob on the tuning LOCK by using the right-angle portion of the Bristol-type socket wrench provided.

(2) Unsolder the leads to the INPUT and OUTPUT meters (M501 and M502, respectively).

(3) Remove the 11 Phillips-head screws on the front panel which are relatively larger than the remaining 24 similar screws (not including the four large panel fasteners in the corners of the panel), and lower the top of the panel onto the bench.

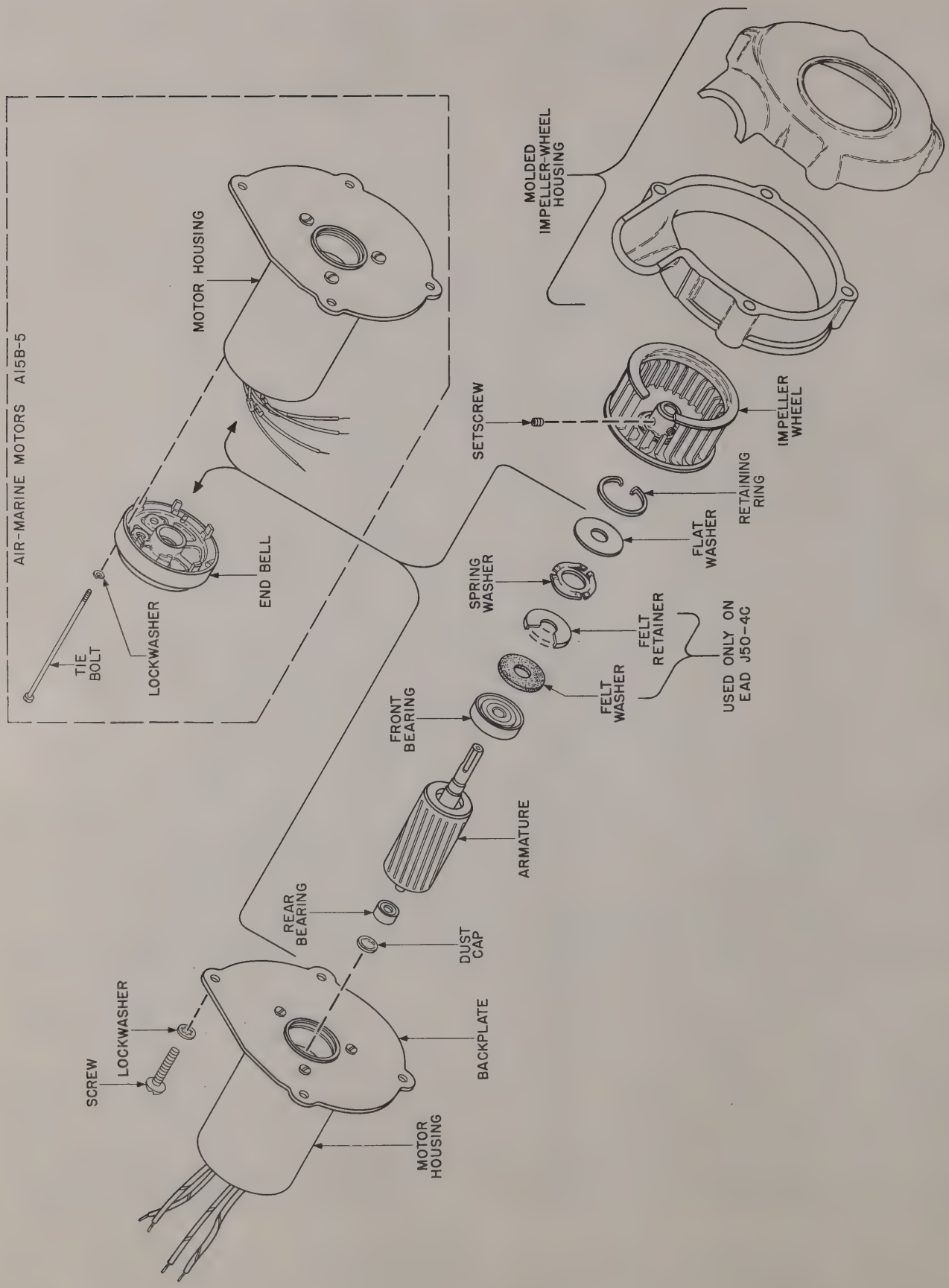


Figure 7-16. Blower BL301, Exploded View

(4) Remove the dual dial-light assembly from the top of the dial-drive assembly.

(5) Remove the drive arm of the flexible coupling between the dial drive and the preselector, by loosening the setscrews in its hub.

(6) Remove the three mounting screws which secure the dial-drive assembly to the preselector.

(7) The procedure for the installation of a new dial-drive unit or the reinstallation of the old one, and replacement of the front panel, etc. is the reverse of the foregoing procedure, except that after the drive assembly, dial lights and front panel have been replaced, steps must be taken to properly align the calibrated tuning dial with the position of the capacitor plates in the preselector. Proceed as follows:

(8) Turn the dial-drive tuning shaft until 225 is indicated on the MEGACYCLES dial.

(9) Turn the driven member of the flexible coupling, attached to the preselector shaft, until the shorter sides of the rotor plates of the ganged capacitors in the preselector are flush with the stator plates, as viewed from the top. These may be seen by removing the left side shielding covers.

(10) Engage the drive member of the flexible drive with the driven member without disturbing the position of the latter, and tighten the setscrews in the hub of the drive member on the output shaft of the dial-drive mechanism.

g. PRESELECTOR. — Removal of the preselector and the reinstallation of the repaired assembly, or the installation of a replacement assembly, is a relatively simple matter. However, some difficulty may be encountered when an attempt is made to coordinate the performance of the ganged capacitors in the preselector with the indications of the calibrated tuning dial. It is therefore suggested that the receiver be placed on its right side and that the following procedure be followed carefully.

(1) REMOVAL.

(*a*) Unsolder, at terminal board E301 (see figure 7–14), those leads which run from the preselector to the terminal board. Tag each terminal to indicate which lead (of the original assembly or of a substitute assembly) is to be reconnected to it.

(*b*) Unsolder, in similar manner, those leads which run to terminal board E206.

(*c*) Unsolder the two leads which connect the oscillator-multiplier section of the preselector unit to CRYSTAL holder XY201 in the left-hand panel compartment.

(*d*) At terminals 3 and 4 of i-f transformer T201, unsolder the length of coaxial cable which connects to the preselector.

(*e*) Take off the left side of the chassis by removing:

1. Three screws entering the side plate from the rear panel.

2. Three screws connecting the side plate to the front-panel subassembly.

3. Four screws entering the side plate from the front panel.

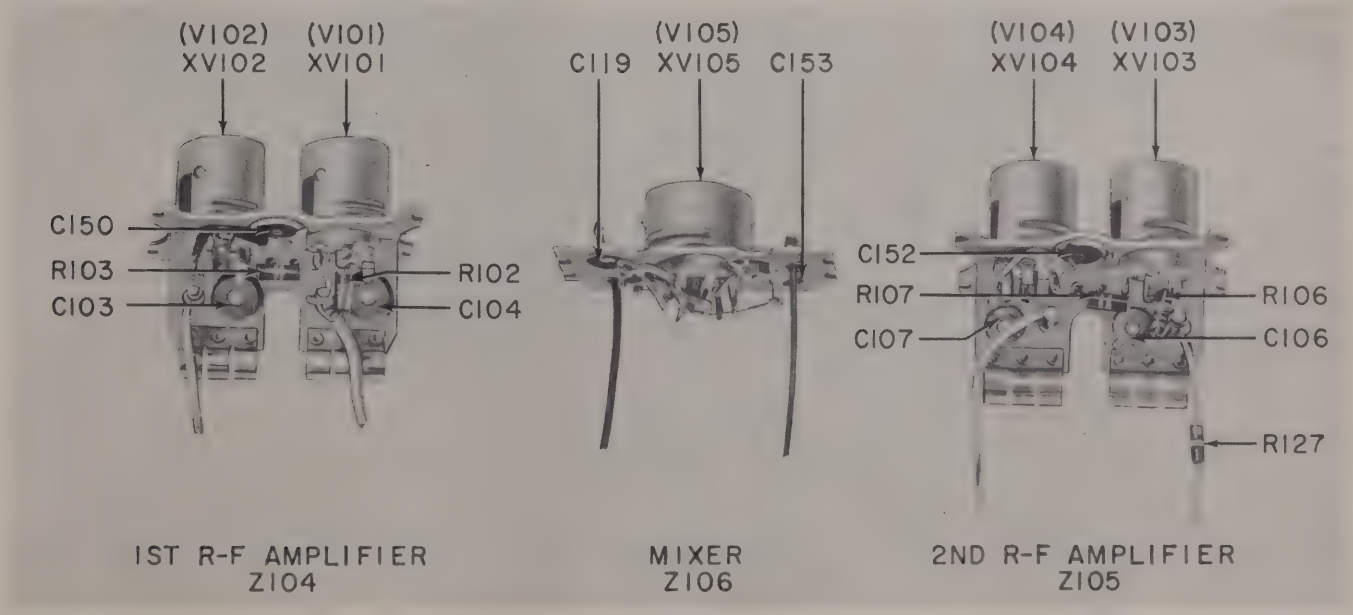


Figure 7–17. Socket Assemblies from R-F Amplifier Section of Preselector

(*f*) Remove rear-panel connector P101 by removing the four screws which secure it.

CAUTION

When removing the screws in the rails holding the preselector in place, as described in steps (7) and (8) below, care must be taken not to damage the bypass-capacitor terminals on the unit (see figures 7–10 and 7–11) by striking them against other parts of the receiver.

(*g*) On top of the chassis (see figure 7–5), note the two rails holding the preselector in place. Detach both rails from the rear panel and from the front-panel subassembly by removing two screws from each rail.

(*h*) On the bottom of the chassis (see figure 7–14), note two similar rails holding the preselector in place. Detach both rails from the rear panel and front-panel assembly, as outlined in step (*g*). Also remove two screws securing the preselector to the bracket on the power supply chassis.

(*i*) Turn the tuning control until 325 is indicated on the MEGACYCLES dial; this should put the arms of the flexible coupling in a vertical position.

(*j*) Remove the three screws which hold the dial-drive assembly to the preselector and withdraw the preselector from the chassis.

(2) REINSTALLATION OF SAME PRESELECTOR.—To reinstall the same preselector, reverse the sequence of steps (*a*) through (*j*) of preceding subparagraph (1). Be certain that the screws which secure the ganged rotor sections on the capacitor shafts face upward as the preselector is put back in place. This can be checked by removing one of the left side shielding covers.

(3) INSTALLATION OF NEW PRESELECTOR WITH SHAFT LOCK.—To install a new preselector which has a shaft lock clamped to one of the capacitor shafts at the rear of the assembly, proceed as follows:

(*a*) Take the flexible coupling member off the shaft of the original preselector and place it on the shaft of the new unit; do not tighten the setscrews in the coupling hub.

(*b*) Install the preselector by reversing the sequence of steps (*a*) through (*j*) of paragraph 6*g*(1).

(*c*) Turn the tuning control until 225 is indicated on the MEGACYCLES dial and lock the tuning control.

(*d*) Rotate the flexible coupling member on the preselector shaft until the two arms of the coupling can be engaged.

(*e*) Tighten the setscrews in the hub of the flexible coupling member on the preselector shaft and remove the shaft lock from the rear of the preselector. *Do not turn the tuning control until this is done,* otherwise the equipment may be damaged.

(4) INSTALLATION OF NEW PRESELECTOR WITHOUT SHAFT LOCK.—To install a new preselector which does not have a shaft lock clamped at the rear of the assembly, proceed as follows:

(*a*) Perform steps (*a*) through (*d*) of preceding subparagraph (3).

(*b*) Remove the left side shielding covers from the preselector and turn the ganged capacitors until the shorter sides of the rotor plates are flush with the stator plates.

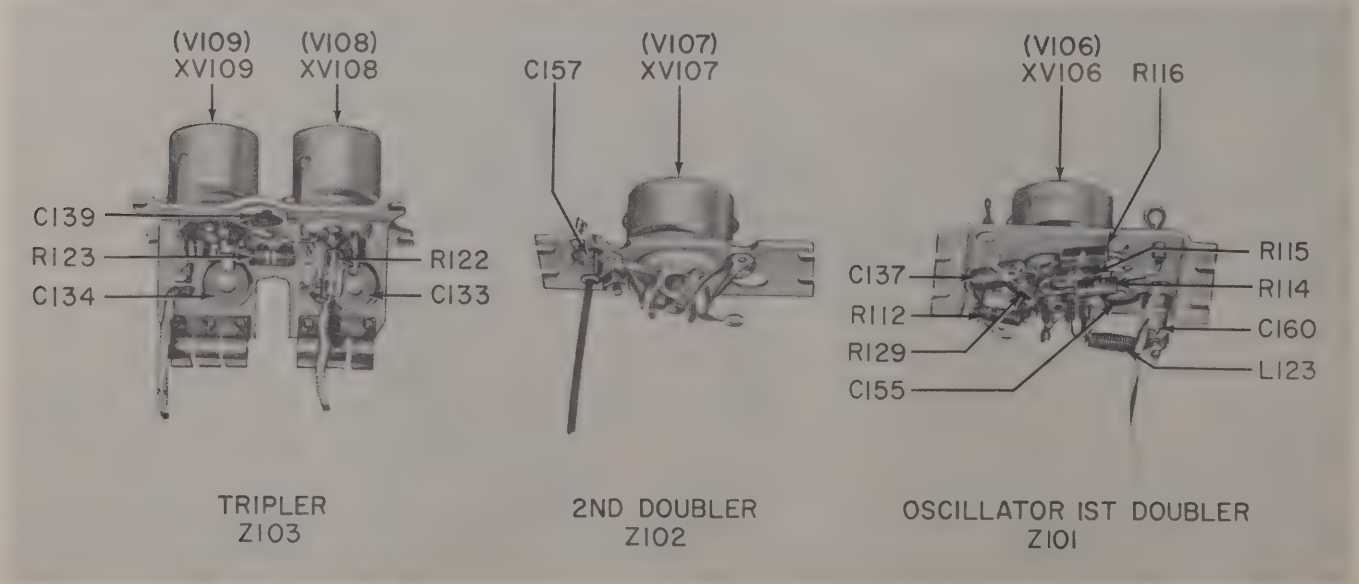


Figure 7–18. Socket Assemblies from Amplifier-Oscillator Section of Preselector

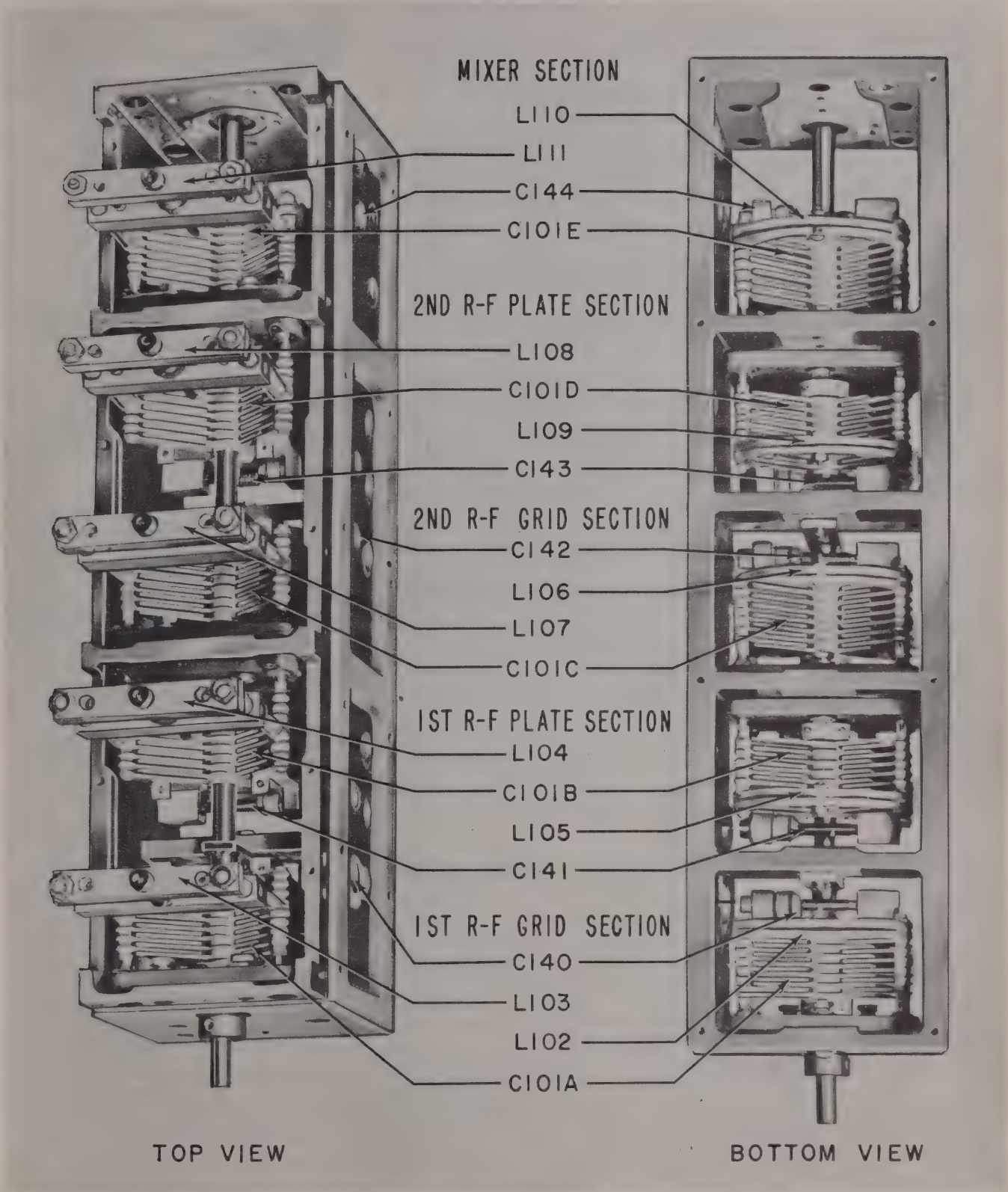


Figure 7–19. Capacitor C101 from R-F Amplifier Section of Preselector

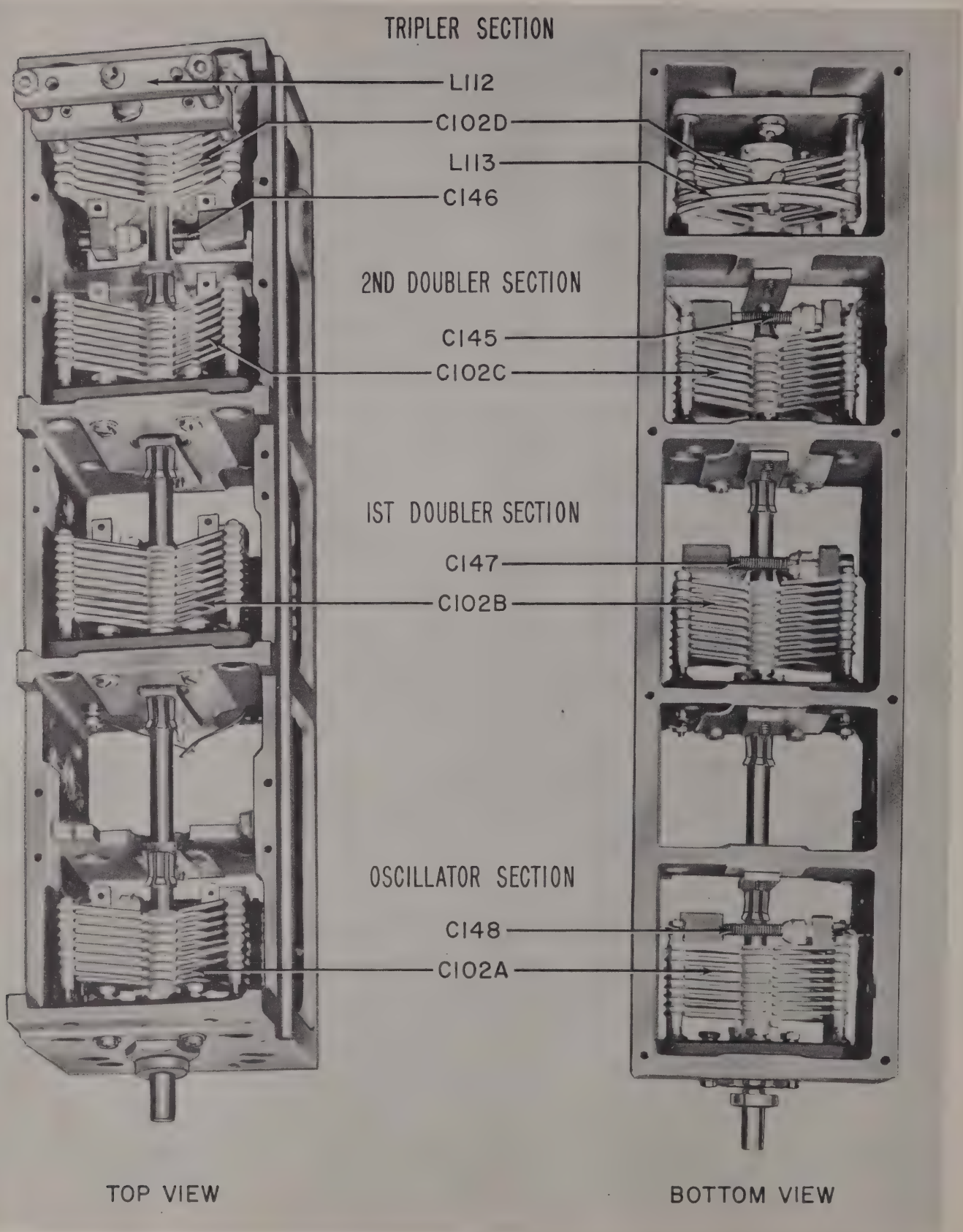


Figure 7–20. Capacitor C102 from Oscillator-Amplifier Section of Preselector

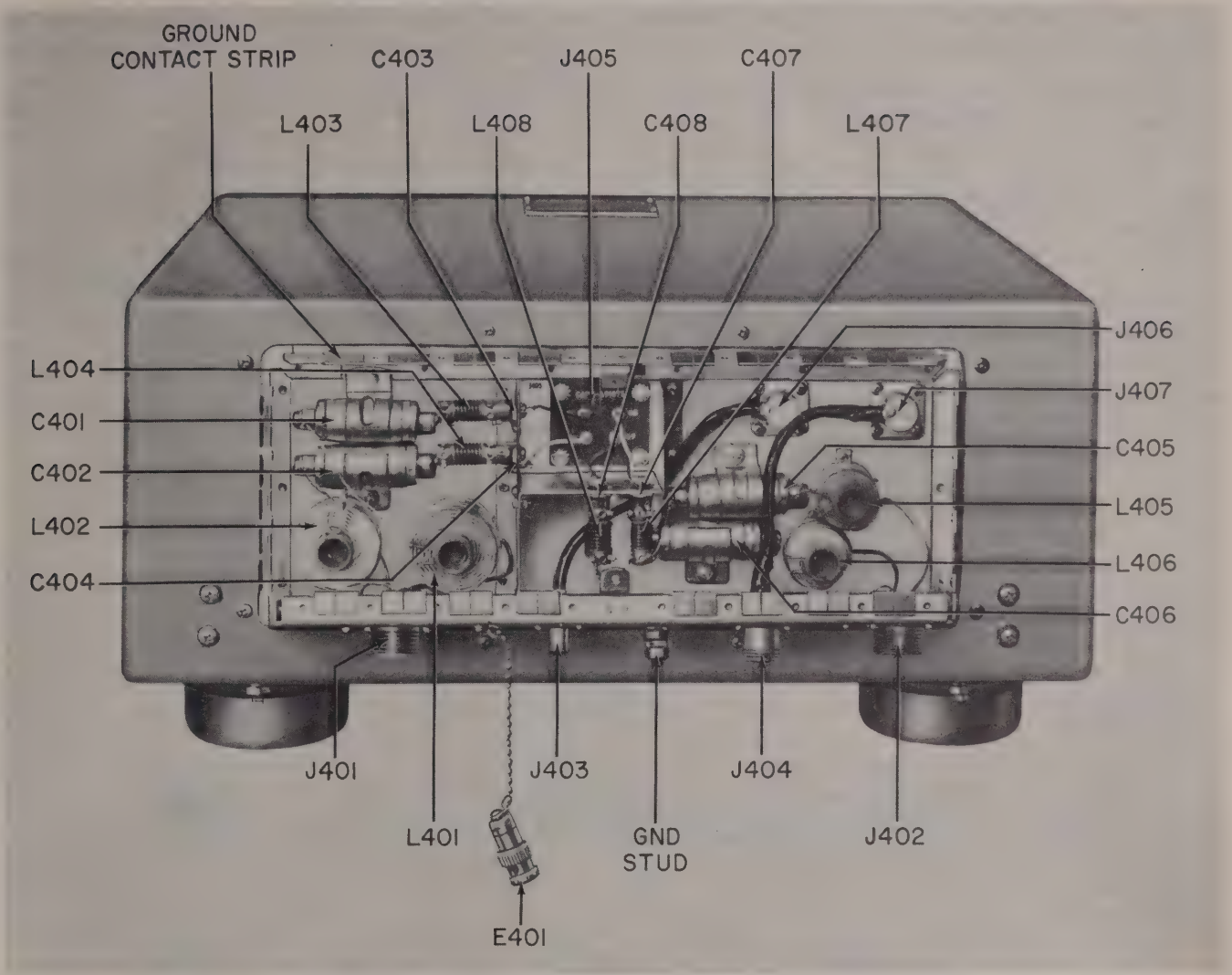


Figure 7–21. Low-Pass Filter F–218/URR–35, Cover Removed

(*c*) With the drive and driven members of the flexible coupling properly engaged, tighten the set-screws in the hub of the driven member on the pre-selector shaft.

b. R-F CABLE ASSEMBLIES.—Several r-f cable assemblies are used in Radio Receiver R–482/URR–35 and in Low-Pass Filter F–218/URR–35. Unless subjected to physical abuse or abnormal conditions of operation, these cables should not require repair or replacement. However, in the event that replacement is found necessary, detailed instructions for the fabrication of the cable assemblies are included in figures 7–22 through 7–25, inclusive. Fabrication instructions for the external r-f cables used with the receiver appear in figures 3–6 and 3–7.

i. ALIGNMENT TOOL H501.—Alignment tool H501 is made up of a body of white nylon, with a screwdriver tip at one end and a short length of Bristol wrench at the other end; see figure 7–5. The body is four inches long, octagonal in the central section, and cylindrical at each end. In the event of the loss of, or damage to, this tool, caution should be observed in the use of a substitute, since in the alignment procedures contact is made with the tool to parts of the circuit which may be at voltages as high as 180 volts with respect to the chassis. If another alignment tool is not available, repair the damaged tool in accordance with the following procedures.

(1) In the event of damage to the screwdriver end of the alignment tool, a substitute can be made from any piece of hard wood, of approximately the same size as the alignment tool.

(2) If the Bristol-wrench end of the alignment tool is broken, but the length of Bristol wrench is still serviceable, proceed as follows:

(*a*) Square off the broken end of the nylon body and drill a hole one-eighth inch deep into that end, using a No. 40 twist drill.

(*b*) Clean off the wrench insert and mark it at a distance of one-eighth inch from one end.

(*c*) Press the wrench insert into the newly drilled hole in the body. A suggested method of accomplishing this is to place both pieces, end to end, between the jaws of a vise and apply pressure.

(3) If the wrench insert is lost or the nylon body damaged beyond repair, any of the substitute materials listed in table 7–4 may be used. In all cases, the length of wrench used should be one-eighth inch greater than the depth of the drilled hole.

7. COMPONENT DATA.

a. ELECTRON TUBES.—The full complement of electron tubes used in Radio Receiver R–482/URR–35 is listed in table 1–4. The rated characteristics of each type appear in table 7–5. Access to the tubes in the receiver and other information pertinent to tube replacement are described in Section 5, paragraph 3*c*.

b. CRYSTALS.—All pertinent data for Crystal Unit CR–24/U (Y201) and Crystal Unit CR–23/U (Y202), used as frequency-controlling elements in this equipment, are shown in figures 7–26 and 7–27, respectively.

c. TRANSFORMERS AND INDUCTORS.—The inductance, d-c resistance, turns ratio, wire size and number of turns, and other miscellaneous information (as applicable) for all transformers, chokes and coils used in this equipment appear in table 7–6.

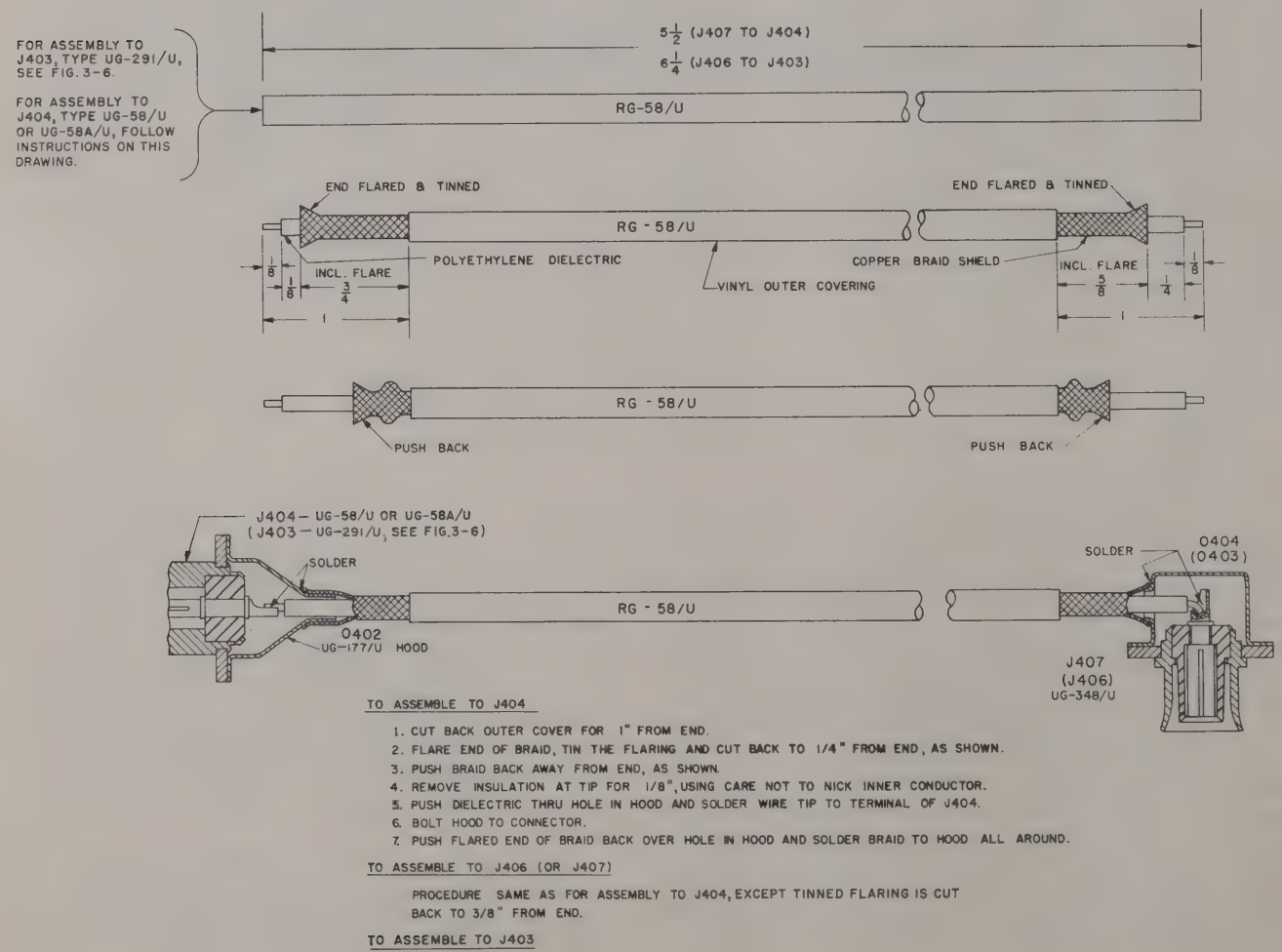
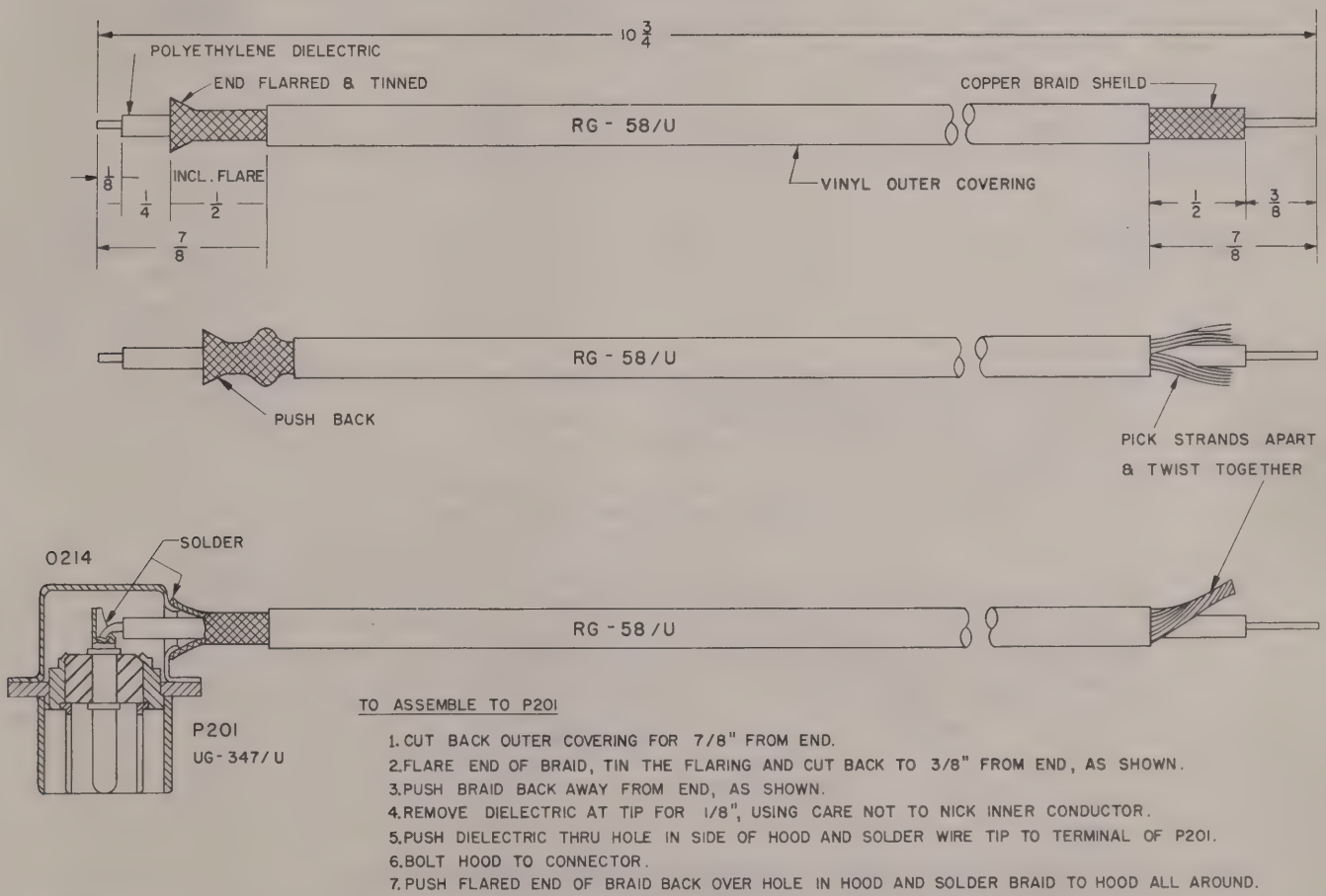


Figure 7–22. Assembling R-F Cable to Connectors J403, J404, J406 and J407

TABLE 7-4. SUBSTITUTE ALIGNMENT-TOOL FABRICATION

BODY MATERIAL	DRILL NO.	DEPTH OF HOLE (INCHES)	WRENCH INSERT
Original nylon body	40	1/2	Allen No. 10–12
Original nylon body	38	1/2	Bristol No. 10–12
Bakelite rod, 1/4 or 5/16 in. diameter	36	1-1/2	Bristol No. 10–12 or Allen No. 10–12
Wood dowel rod, 5/16 in. diameter	42	1-1/2	Bristol No. 10–12 or Allen No. 10–12



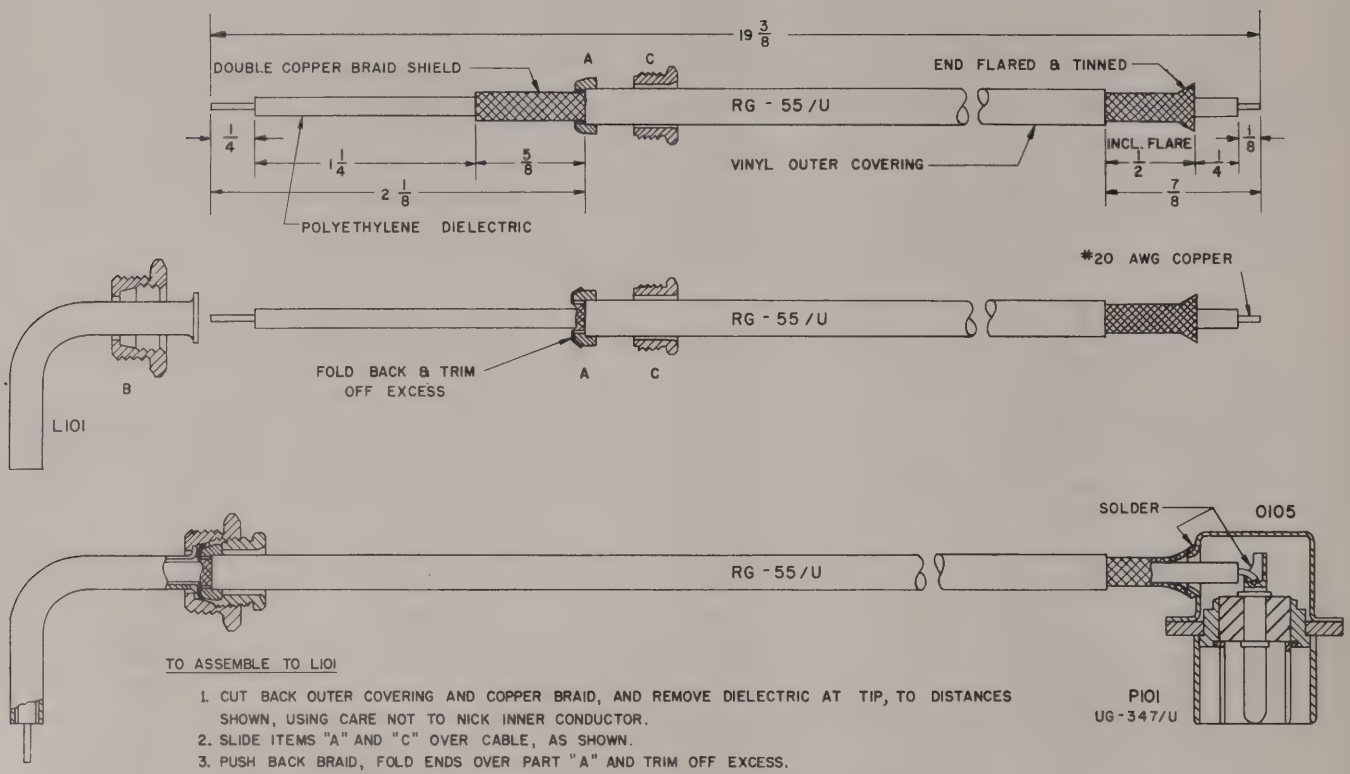
TO ASSEMBLE TO P201

1. CUT BACK OUTER COVERING FOR 7/8" FROM END.
2. FLARE END OF BRAID, TIN THE FLARING AND CUT BACK TO 3/8" FROM END, AS SHOWN.
3. PUSH BRAID BACK AWAY FROM END, AS SHOWN.
4. REMOVE DIELECTRIC AT TIP FOR 1/8", USING CARE NOT TO NICK INNER CONDUCTOR.
5. PUSH DIELECTRIC THRU HOLE IN SIDE OF HOOD AND SOLDER WIRE TIP TO TERMINAL OF P201.
6. BOLT HOOD TO CONNECTOR.
7. PUSH FLARED END OF BRAID BACK OVER HOLE IN HOOD AND SOLDER BRAID TO HOOD ALL AROUND.

TO PREPARE FREE END

1. CUT BACK OUTER COVERING AND COPPER BRAID TO DISTANCES SHOWN, AND REMOVED DIELECTRIC TO EDGE OF BRAID (3/8") USING CARE NOT TO NICK INNER CONDUCTOR.
2. PICK APART STRANDS OF BRAID, PULL THESE TO ONE SIDE OF DIELECTRIC AND TWIST TO FORM SINGLE STRAND, AS SHOWN.

Figure 7–23. Assembling R-F Cable to Connector P201 and Preparation of Free End for Connection to IF/AF Chassis



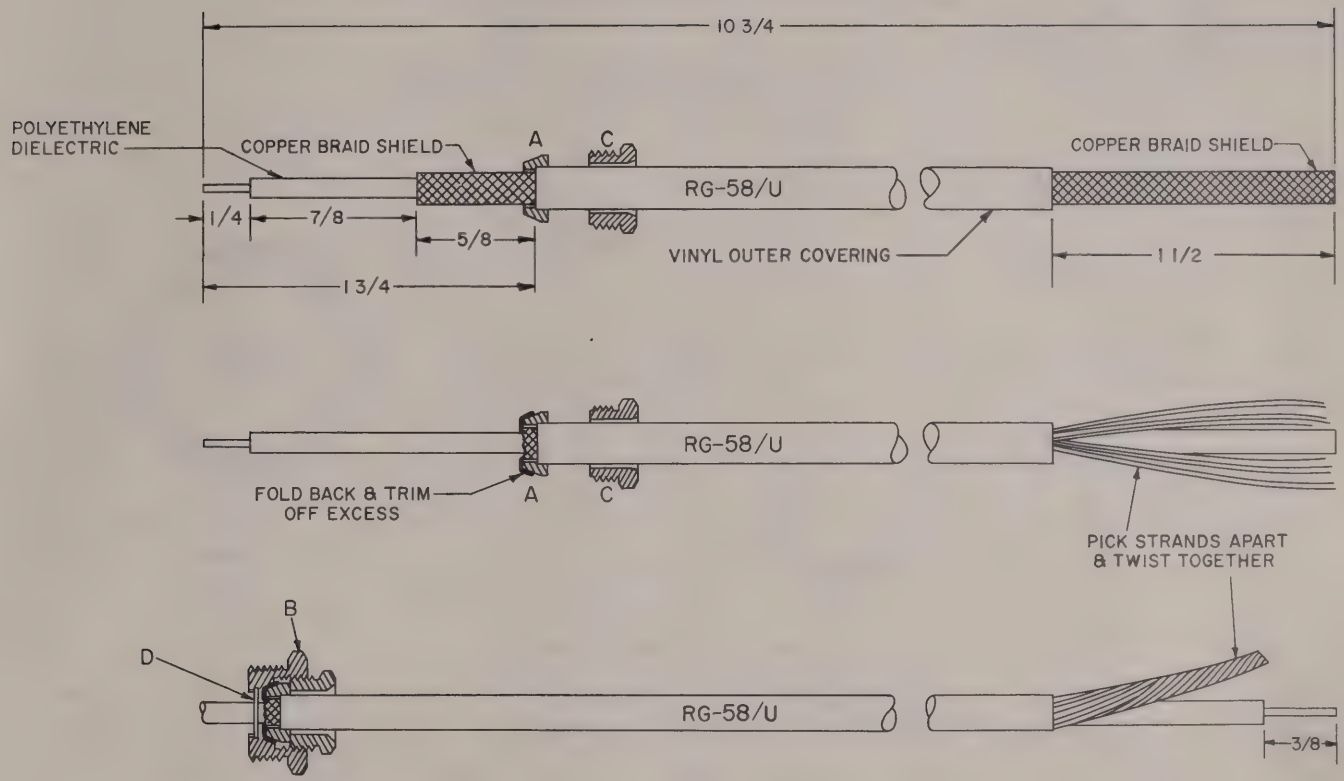
TO ASSEMBLE TO L101

1. CUT BACK OUTER COVERING AND COPPER BRAID, AND REMOVE DIELECTRIC AT TIP, TO DISTANCES SHOWN, USING CARE NOT TO NICK INNER CONDUCTOR.
2. SLIDE ITEMS "A" AND "C" OVER CABLE, AS SHOWN.
3. PUSH BACK BRAID, FOLD ENDS OVER PART "A" AND TRIM OFF EXCESS.
4. PUSH DIELECTRIC THRU L101.
5. SCREW TOGETHER PARTS "B" AND "C" (AFTER INSTALLATION OF PART "B" IN PRESELECTOR).
6. TRIM END SO DIELECTRIC IS FLUSH WITH END OF L101, AND WIRE TIP IS 1/4" LONG.

TO ASSEMBLE TO P101

1. CUT BACK OUTER COVERING FOR 7/8" FROM END.
2. FLARE END OF BRAID, TIN THE FLARING AND CUT BACK TO 3/8" FROM END, AS SHOWN.
3. REMOVE DIELECTRIC AT TIP FOR 1/8" USING CARE NOT TO NICK INNER CONDUCTOR.
4. PUSH DIELECTRIC THRU HOLE INSIDE OF HOOD AND PUSH FLARED END OF BRAID OVER HOLE IN HOOD AND SOLDER BRAID TO HOOD ALL AROUND.
5. SOLDER WIRE TIP TO TERMINAL OF P101.
6. BOLT HOOD TO CONNECTOR.

Figure 7–24. Assembling R-F Cable to Connector P101



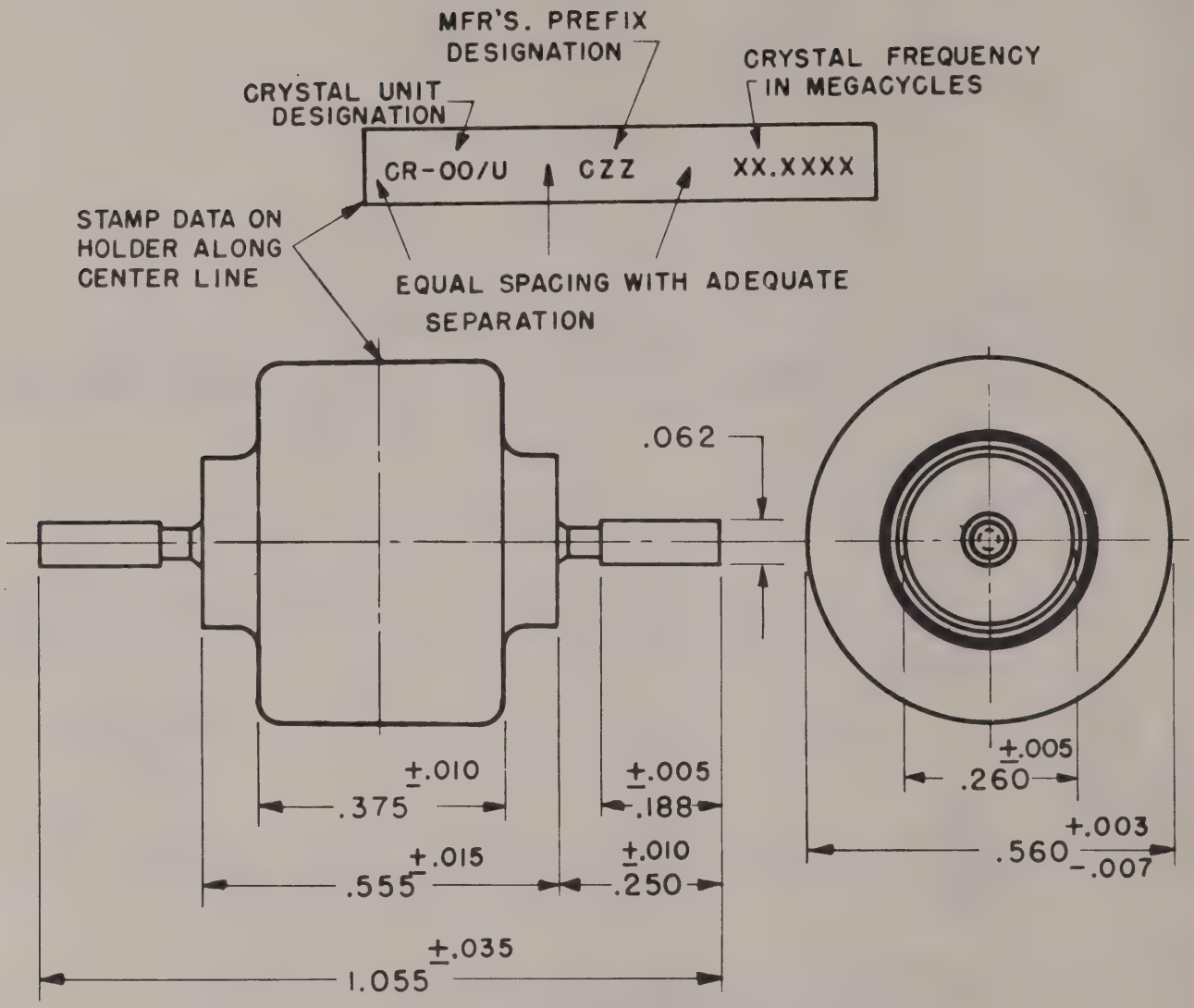
TO PREPARE FREE END

1. CUT BACK OUTER COVERING TO DISTANCE SHOWN.
2. PICK APART STRANDS OF BRAID, PULL THESE TO ONE SIDE OF DIELECTRIC AND TWIST TO FORM SINGLE STRAND, AS SHOWN.
3. REMOVE DIELECTRIC TO DISTANCE SHOWN USING CARE NOT TO NICK INNER CONDUCTOR.

TO ASSEMBLE FITTING

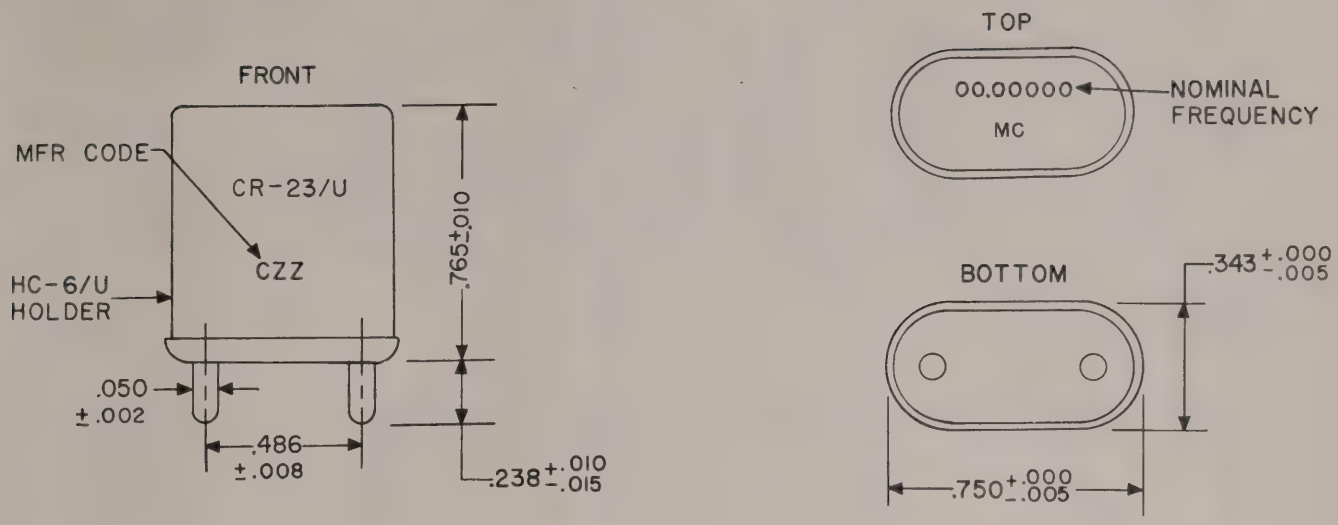
1. CUT BACK OUTER COVERING AND COPPER BRAID, AND REMOVE DIELECTRIC AT TIP, TO DISTANCES SHOWN, USING CARE NOT TO NICK INNER CONDUCTOR.
2. SLIDE ITEMS "A" AND "C" OVER CABLE, AS SHOWN.
3. PUSH BACK BRAID, FOLD ENDS OVER PART "A" AND TRIM OFF EXCESS.
4. PUSH DIELECTRIC THRU PART "B" AND "D".
5. SCREW TOGETHER PARTS "B" AND "C" (AFTER INSTALLATION OF PART "B" IN PRESELECTOR).

Figure 7-25. Connecting R-F Cable between Inductance L122 and Transformer T201



1. FREQUENCY RANGE OF CRYSTALS USED = 20.1125 TO 35.2167 MC.
2. FIRST INTERMEDIATE FREQUENCY OF RECEIVER = 18.6 MC.
3. HETERODYNE FREQUENCY RANGE = 241.35 TO 422.60 MC.
4. METHOD OF MULTIPLICATION = CRYSTAL FREQUENCY X2X2X3; SEE SCHEMATIC DIAGRAM, FIGURE (2-5)
5. TEMP. CHARACTERISTIC = ± 0.005 % DEVIATION BETWEEN −55° C (−67° F) AND + 90° C (+194° F).
6. TEMPERATURE OF OPERATION AND CALIBRATION = −55° C (−67° F) TO + 90° C (+194° F)
7. MODE OF OPERATION = 5 TH MODE FOR 25 − 50 MC.; 3RD MODE FOR 15 − 25 MC.

Figure 7–26. Crystal Unit CR–24/U, Outline and Data



1. FREQUENCY OF CRYSTAL USED = 16.8250 MC.
2. SECOND INTERMEDIATE FREQUENCY OF RECEIVER = 1.775 MC.
3. TEMP. CHARACTERISTIC = ± 0.005% DEVIATION BETWEEN −55°C (−67°F) AND +90°C (+194°F).
4. TEMPERATURE OF OPERATION AND CALIBRATION = −55°C (−67°F) TO +90°C (+194°F).

Figure 7–27. Crystal Unit CR–23/U, Outline and Data

TABLE 7–5. TUBE CHARACTERISTICS

TUBE TYPE	FILAMENT VOLTAGE (V)	FILAMENT CURRENT (A)	PLATE VOLTAGE (V)	GRID BIAS (V)	SCREEN VOLTAGE (V)	PLATE CURRENT (MA)	SCREEN CURRENT (MA)	A-C PLATE RES. (OHMS)	VOLTAGE AMPL. FACTOR (MU)	NORMAL TRANSCONDUCT. (MICROMHOS)
OA2	...	....	150	...	...	5–30	...	....	...	....
OB2	...	....	108	...	...	5–30	...	....	...	....
6AK6	6.3	0.15	180	−9	180	15	2.5	200K	...	2300
5654/ 6AK5W	6.3	0.175	180	−2	120	7.7	2.4	690K	...	5100
5670	6.3	0.3	150	−2	...	8.2*	...	6370	35	5500
			MAX. PEAK INVERSE PLATE VOLTAGE (V)	A-C VOLTS PER PLATE (V)	D-C OUTPUT CURRENT PER PLATE (MA)	PEAK CURRENT PER PLATE (MA)				
5726/ 6AL5W	6.3	0.3	330	117	9	54				
5931	5	3	1550	550	225	675				

* Plate current per section.

TABLE 7–6. WINDING DATA

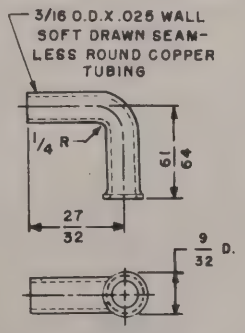
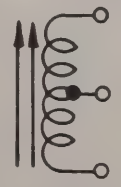
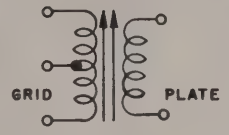
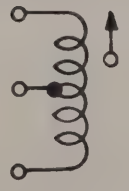
DESIG-NATION SYMBOL	PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D-C RESIST. (OHMS)	INDUCTANCE	HIPOT A-C VOLTS	REMARKS
L101	FDR A1003744		90° elbow	3/16" O.D. x tube; 0.0005" silver plate 0.025" wall round copper	S.D. seamless 1/4				
L114	FDR A1003798–1		Single-layer solenoid	#20 bare tinned	14, tapped 5-11/16 turns from mtg end		1.4 uh		Wound on 7/16" D. ceramic form; powdered iron slug
L115	FDR A1003822–1		Grid Plate	#20 bare tinned #20 bare tinned	6, tapped at 2-7/8 turns 5-3/8				Both windings wound 8 turns/in. on 7/8" D. mica-filled bakelite form; powdered iron slug
L116	FDR A1003828–1		Single-layer solenoid	#20 bare tinned	9, tapped 5 turns from mtg end	0.01	0.58 uh at 100 ma dc		Wound on 7/16" D. mica-filled bakelite form
L117	FDR A1003850–1		Single-layer solenoid	#20 bare tinned	3 C.T.	0.007	0.09 uh at 25 and 50 mc, and 100 ma dc		Wound on 7/16" D. mica-filled bakelite form; brass slug

TABLE 7-6. WINDING DATA (Cont)

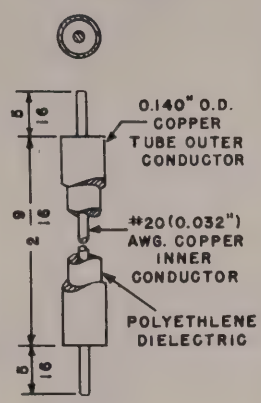
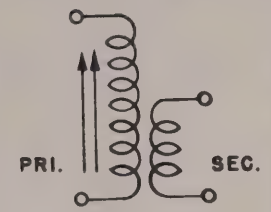
DESIG-NATION SYMBOL	PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D-C RESIST. (OHMS)	INDUCTANCE	HIPOT A-C VOLTS	REMARKS
L118	FDR A1003745		Concentric	Coaxial cable 0.140" O.D. x 3-3/16" lg					0.0002" silver plate
L122	FDR A1003748-1		Pri. Sec.	#26 bare tinned #26 bare tinned	7-1/4 5/6				Both windings wound 28 turns/in. on 7/8" D. bakelite form; powdered iron slug
L123	FDR A1003037-1		Single-layer solenoid	#30 E	27	0.133	1.2 uh		Q: 80 at 25 mc Close-wound on 5/32" D. bakelite form
L201 through L206	FDR A1003873-1		Single-layer solenoid	#30 E	45	0.255	3 uh		Q: 50 at 25 mc Close-wound on 13/64" D. phenolic form

TABLE 7–6. WINDING DATA (Cont)

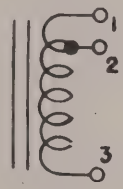
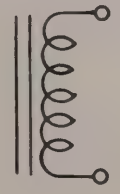
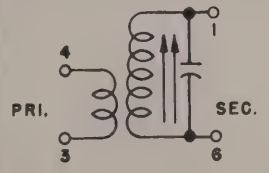
DESIG-NATION SYMBOL	PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D-C RESIST. (OHMS)	INDUCTANCE	HIPOT A-C VOLTS	REMARKS
L301	FDR RC–8113–1		Single	#31 E	5700, tapped at 11.4% of total	350	12 h at 145 ma dc and 10 v rms, 60 cps	1600 rms	
L401 L402	FDR A1003452–1		Single universal, 3 pies	#22 DCC	240 (80 per pie)	1.12	1.26 mh at 1.5 amp dc		Q: 25 at 225 kc Wound on 5/8" D. x 1-11/16" lg phenolic tube, with 1" lg iron core cemented inside 9/32" from free end Distributed cap: 4 uuf
L403 L404 L407 L408	FDR A1003458–1		Single-layer solenoid	#22 E	7–1/2	0.013	0.339 uh at 10 and 20 mc, and 2 amp dc		Q:100 at 14 mc Wound on 3/8" D. phenolic form
L405 L406	FDR A1003460–1		Single universal, 3 pies	#26 DCC	210 (70 per pie)	1.96	1.08 mh at 300 ma dc	100 rms	Wound on 5/8" D. x 1-11/16" lg phenolic tube, with 1" lg iron core cemented inside 9/32" from free end
T201	FDR A1013002		Pri. Sec.	#28 bare tinned #28 bare tinned	2 8		 Resonant at 18.6 mc with 100 uuf		Both windings wound 28 turns/in. on 3/8" D. form and spaced equivalent of 1/3 turn Powdered iron slug in sec.

TABLE 7-6. WINDING DATA (Cont)

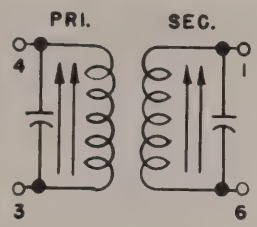
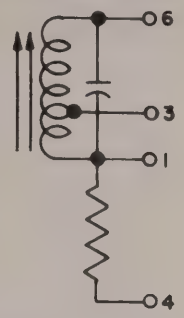
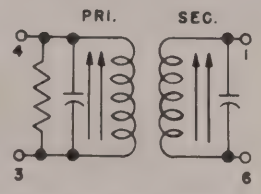
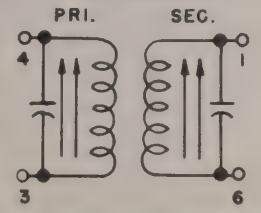
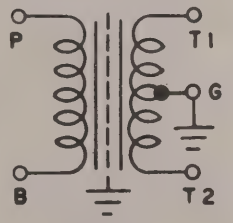
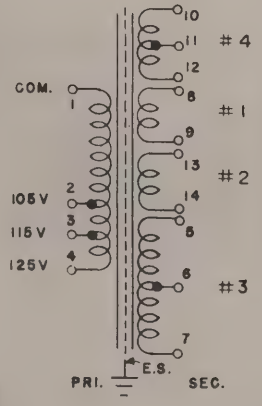
DESIG-NATION SYMBOL	PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D-C RESIST. (OHMS)	INDUCTANCE	HIPOT A-C VOLTS	REMARKS
T202	FDR A1013003		Pri. Sec.	#28 bare tinned #28 bare tinned	9 9		Resonant at 18.6 mc with 100 uuf Resonant at 18.6 mc with 100 uuf		Top 7 turns wound 28 turns/in; 2 bottom turns wound in space equal to 8 turns at same rate Bottom 7 turns wound 28 turns/in; 2 top turns wound in space equal to 7 turns at same rate Windings spaced equivalent of 9 turns at 28 turns/in. on 3/8" D. form; 2 powdered iron slugs
T203	FDR A1013004		Single-layer solenoid	#28 bare tinned	8, tapped 2 turns from bottom		Resonant at 16.825 mc with 100 uuf		Wound 28 turns/in. on 3/8" D. form; powdered iron slug; 2200-ohm res. between bottom of coil and term. 4
T204 T206 T208	FDR A1013005		2 universal, 1 pie each	7/44 D.S. Litz	76 (each winding)		Each winding resonant at 1.775 mc with 100 uuf		Both windings wound on 3/8" D. form and spaced 0.255"; 2 powdered iron slugs Pri. shunted with 12,000-ohm resistor
T205 T207	FDR A1013006		2 universal, 1 pie each	7/44 D.S. Litz	76 (each winding)		Each winding resonant at 1.775 mc with 100 uuf		Both windings wound on 3/8" D. form and spaced 0.315"; 2 powdered iron slugs

TABLE 7–6. WINDING DATA (Cont)

DESIG-NATION SYMBOL	PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D-C RESIST. (OHMS)	INDUCTANCE	HIPOT A-C VOLTS	REMARKS
T209	FDR RC–7899–1		Pri. Sec.	#40 E #29 E	2600 210 C.T.	710 5.3			Impedance ratio 10,000:60 Electrostatic shield between pri. and sec. windings grounded to case
T210	FDR A1013001		Single universal, 1 pie	#35 Formvar	125		Resonant at 1.775 mc with 10 uuf		Wound on 3/8" D. form; powdered iron slug 1000-ohm resistor between top of coil and term. 1
T301	FDR RC–8115–1		Pri. Sec. #1 Sec. #2 Sec. #3 Sec. #4	#22 E #17 E 2–#19 E #30 E #24 E	334 between term. 1 and 4; tapped at 283 turns (term. 2) and 310 turns (term. 3) 14–1/2 18 1320 C.T. 18 C.T.	2.38 between term. 1 and 2 2.48 between term. 1 and 3 2.60 between term. 1 and 4 0.055 0.055 85 0.32		2000 V rms between sec. #1 and # 3 1200 V rms between sec. #1 and ground or all other windings 1000 V rms between all other windings and/ or ground	105/115/125 v, 50/60 cps, 1 ph. Electrostatic shield between pri. and sec. windings grounded to case 5 v at 3.0 amp 6.3 v at 4.1 amp 470 v C.T. at 145 ma 6.3 v C.T. at 0.6 amp

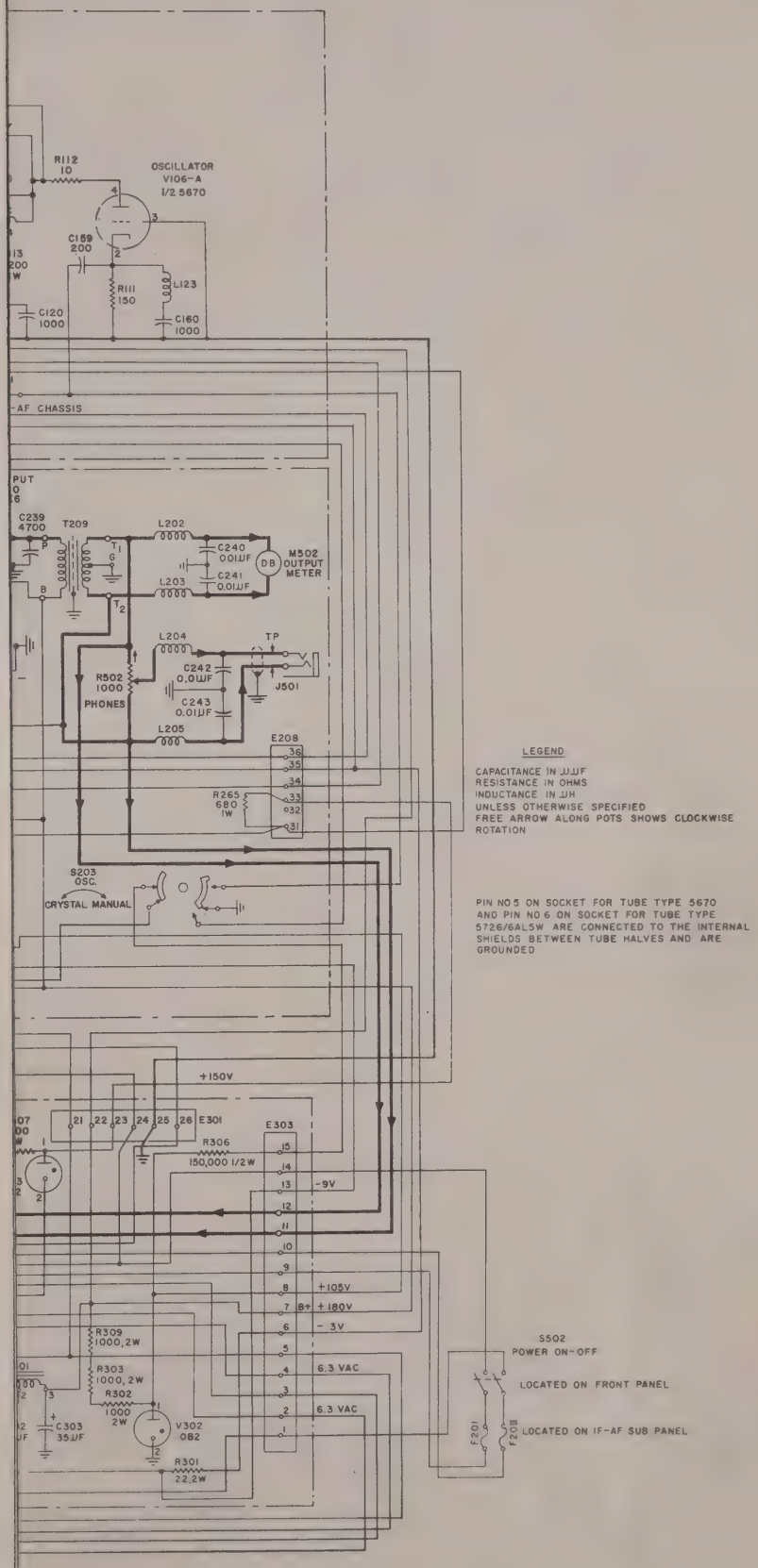
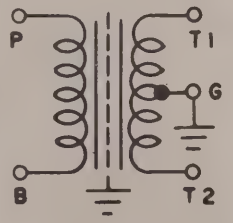
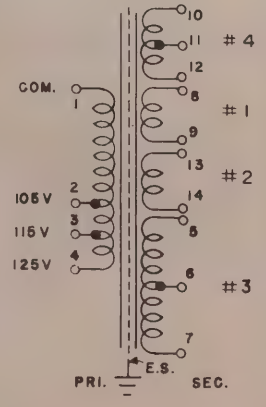


Figure 7–28. Radio Receiver R–482/URR–35, Schematic Diagram

TABLE 7–6. WINDING DATA (Cont)

DESIGNATION SYMBOL	PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D-C RESIST. (OHMS)	INDUCTANCE	HIPOT A-C VOLTS	REMARKS
T209	FDR RC–7899–1		Pri. Sec.	#40 E #29 E	2600 210 C.T.	710 5.3			Impedance ratio 10,000:60 Electrostatic shield between pri. and sec. windings grounded to case
T210	FDR A1013001		Single universal, 1 pie	#35 Formvar	125		Resonant at 1.775 mc with 10 uuf		Wound on 3/8" D. form; powdered iron slug 1000-ohm resistor between top of coil and term. 1
T301	FDR RC–8115–1		Pri. Sec. #1 Sec. #2 Sec. #3 Sec. #4	#22 E #17 E 2–#19 E #30 E #24 E	334 between term. 1 and 4; tapped at 283 turns (term. 2) and 310 turns (term. 3) 14–1/2 18 1320 C.T. 18 C.T.	2.38 between term. 1 and 2 2.48 between term. 1 and 3 2.60 between term. 1 and 4 0.055 0.055 85 0.32		2000 V rms between sec. #1 and # 3 1200 V rms between sec. #1 and ground or all other windings 1000 V rms between all other windings and/ or ground	105/115/125 v, 50/60 cps, 1 ph. Electrostatic shield between pri. and sec. windings grounded to case 5 v at 3.0 amp 6.3 v at 4.1 amp 470 v C.T. at 145 ma 6.3 v C.T. at 0.6 amp

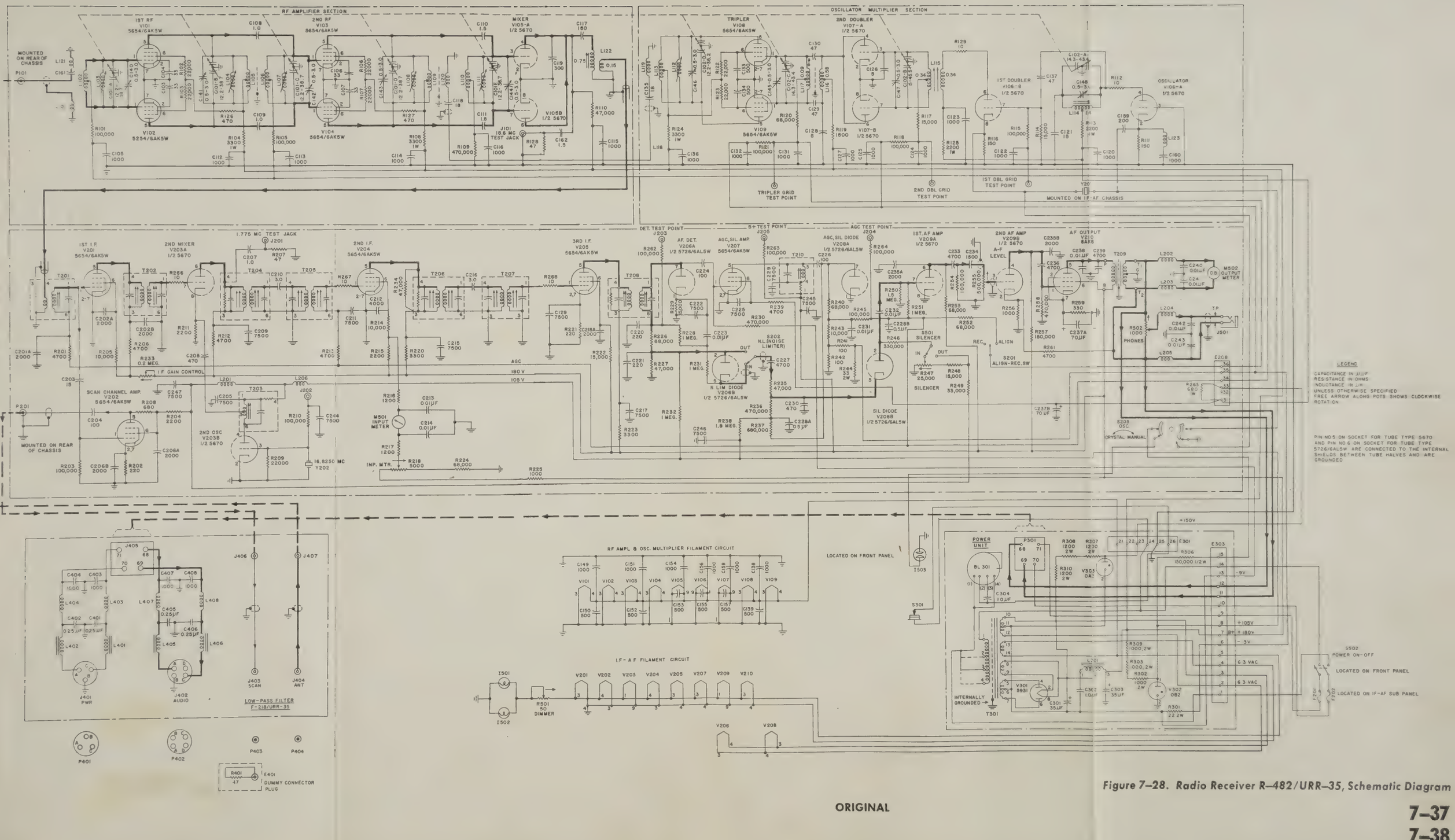
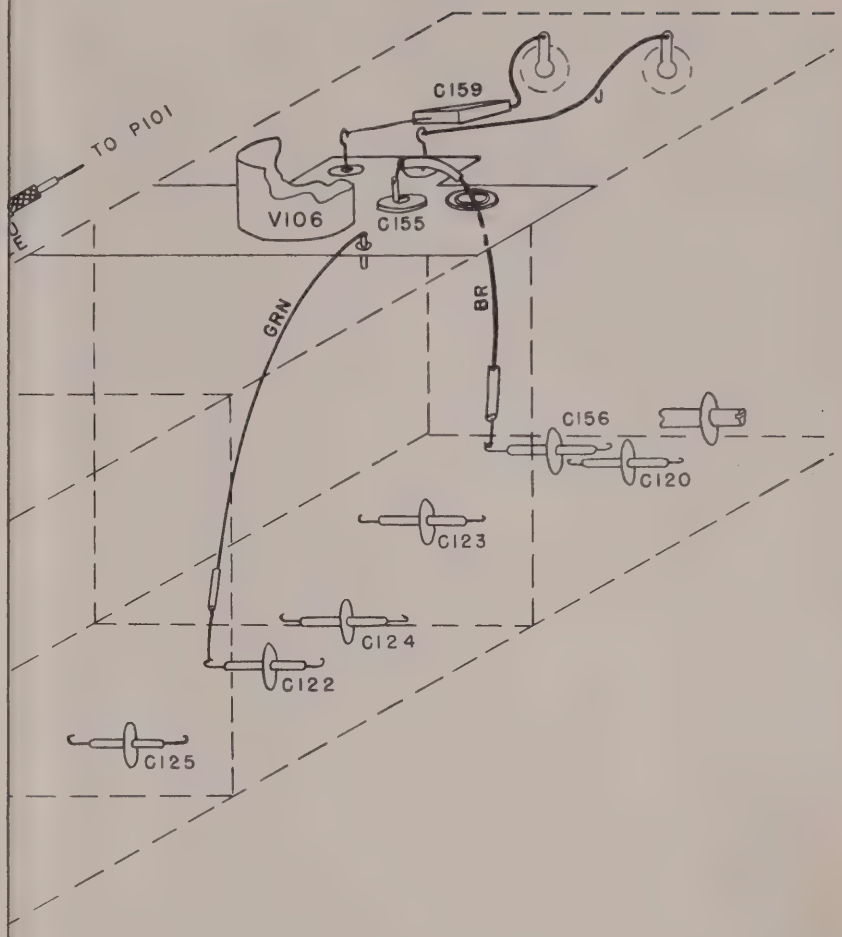
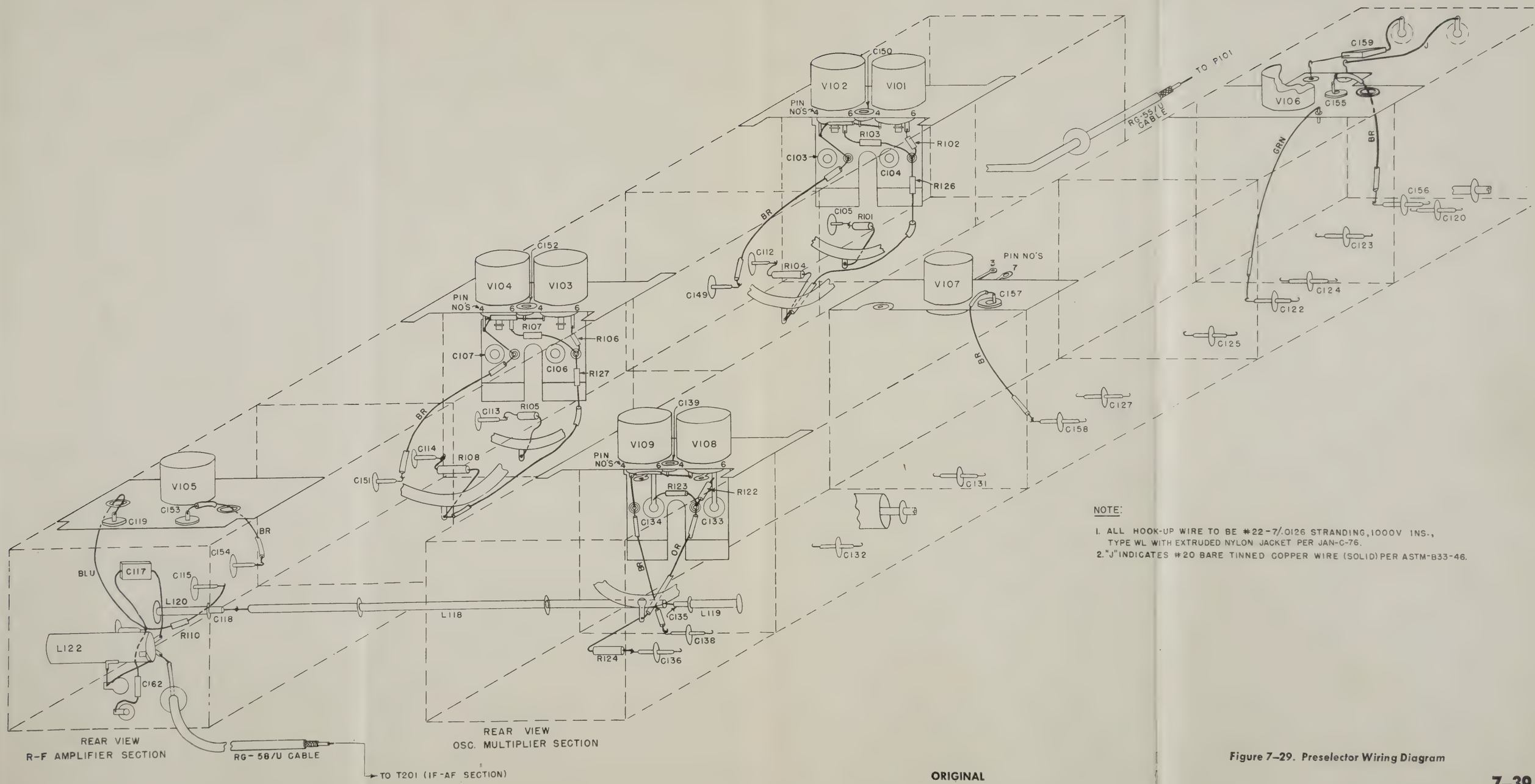


Figure 7–28. Radio Receiver R–482/URR–35, Schematic Diagram



-UP WIRE TO BE #22-7/.0126 STRANDING, 1000V INS.,
ITH EXTRUDED NYLON JACKET PER JAN-C-76.
ES #20 BARE TINNED COPPER WIRE (SOLID) PER ASTM-B33-46.

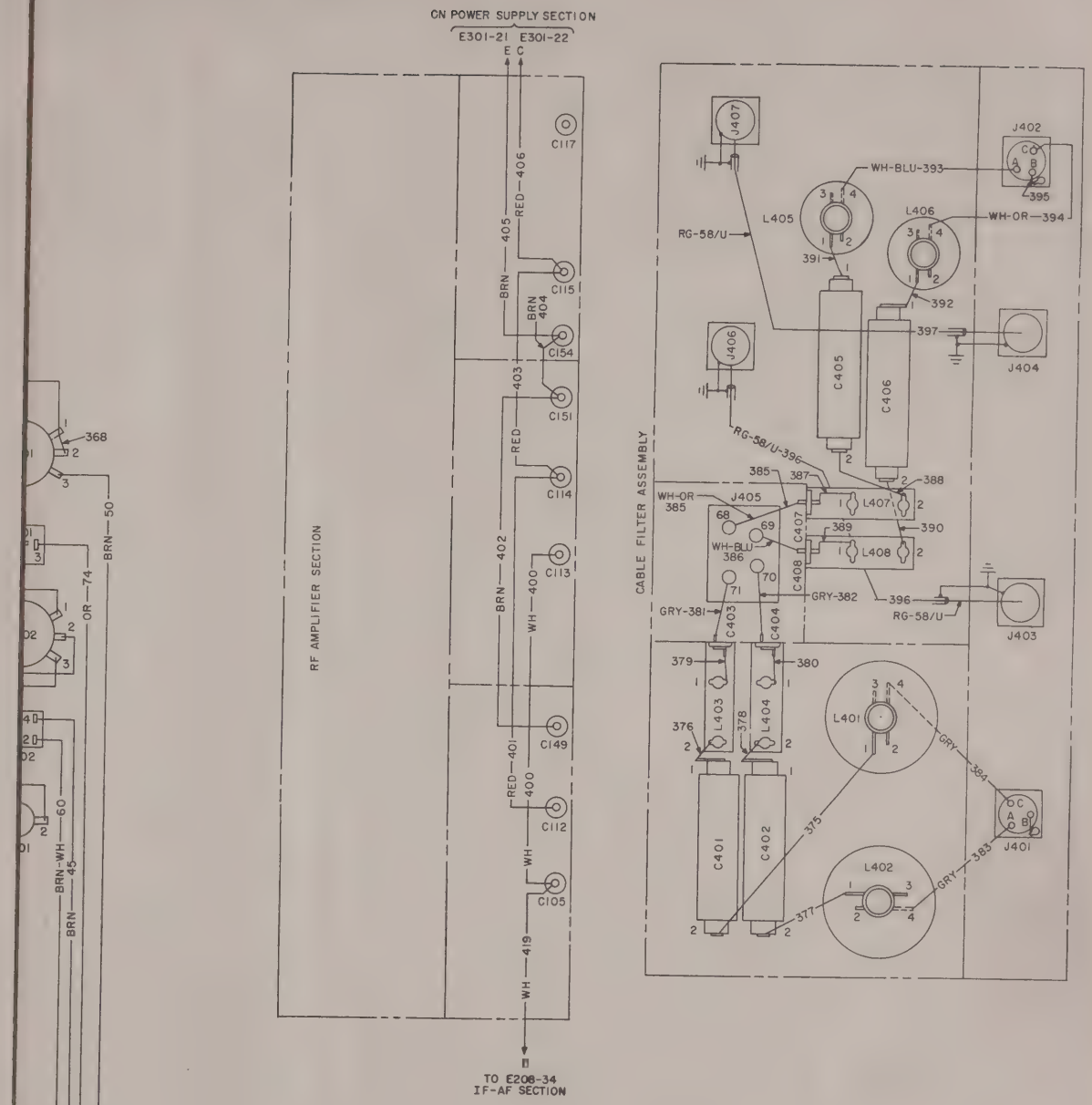
Figure 7–29. Preselector Wiring Diagram



NOTE:

1. ALL HOOK-UP WIRE TO BE #22-7/.0126 STRANDING, 1000V INS., TYPE WL WITH EXTRUDED NYLON JACKET PER JAN-C-76.
2. "J" INDICATES #20 BARE TINNED COPPER WIRE (SOLID) PER ASTM-B33-46.

Figure 7–29. Preselector Wiring Diagram



* DENOTES SLEEVING ON WIRE

re 7–30. IF/AF Chassis, Power Supply and Low-Pass Filter F–218/URR–35, Wiring Diagram

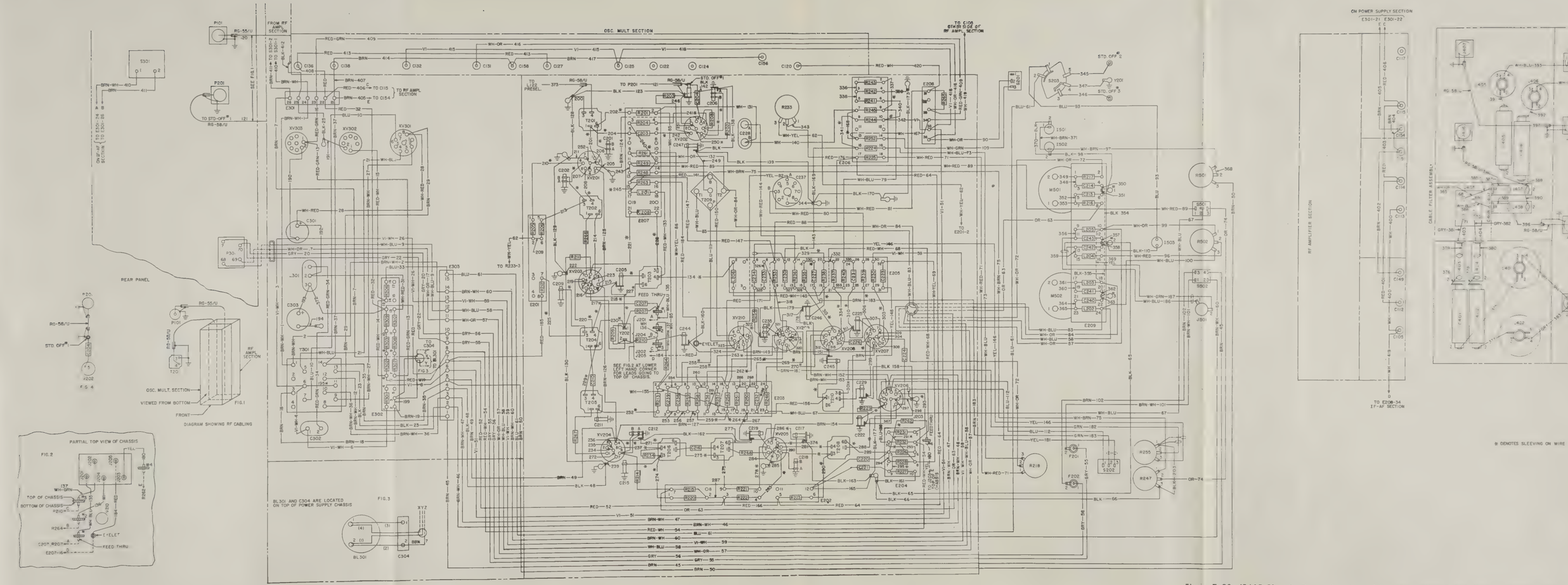


Figure 7–30. IF/AF Chassis, Power Supply and Low-Pass Filter F–218/URR–35, Wiring Diagram

SECTION 8
PARTS AND SPARE PARTS LISTS
(AND MISCELLANEOUS TABLES)

TABLE 8–1. LIST OF MAJOR UNITS

SYMBOL GROUP	QUANTITY	NAME OF MAJOR UNIT	DESIGNATION	STANDARD NAVY STOCK NUMBER
101–599	1	Receiver, Radio, including	R–482/URR–35	
101–199	1	Amplifier-Converter (Preselector)		
201–299	1	IF/AF Section		
301–399	1	Power Supply Section		
401–499	1	Filter, Low-Pass	F–218/URR–35	
501–599	1	Front Panel Section and Cabinet		
601–699		Test Cables, including		
(W601)	1	Radio Frequency Cable Assembly	CG–839/U (4′–2″)	
(W602)	1	Electrical Power Cable Assembly	CX–1869/U (4′–4″)	

TABLE 8–2 TABLE OF REPLACEABLE PARTS

REFERENCE DESIGNATION	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
A501	N17–M–75268–6626	MOUNT, vibration: sq mtg; 60–70 lb normal load rating; 3″ sq x 1-1/2″ h; rubber cushion; metal sleeve for 5/16″ dia thru-bolt; four 0.225″ dia mtg holes 2-1/2″ x 2-1/2″ c to c; metal parts cad pl; BLC pt #C–2070, FDR dwg #A1002059	Shock absorption
502		Same as A501	Shock absorption
A503		Same as A501	Shock absorption
A504		Same as A501	Shock absorption
*BL301	N17–B–21188–1075	BLOWER, air: centrifugal vane; 10 cfm at 3300 rpm; direct drive, clockwise rotation; plastic housing; motor 115 v, 50/60 cyc, 0.11 amp, 1 ph, 12.5 w; 4-1/8″ lg x 3-17/32″ wd x 3-43/64″ h; EAD type J50–4C, FDR dwg #C1003648–1	Cabinet cooling
*BL301		BLOWER, air: same as N17–B–21188–1075 except motor housing black anodize finish; AAP type BC–1615B–4, FDR dwg #C1003648–2	Cabinet cooling
*BL301		BLOWER, air: centrifugal vane 10 cfm at 3300 rpm; direct drive; clockwise rotation; plastic housing; motor 115 v, 50/60 cyc, 0.11 amp, 1 ph, 9.0 w; motor housing green anodize finish; 4-1/64″ lg x 3-17/32″ wd x 3-43/64″ h; bkt mtd; AAGB type A15B–5, FDR dwg #C1003648–3	Cabinet cooling
C101		TUNER, RF: air dielectric; plate meshing type; 5 sections each 12.2 to 38.7 mmf; SLF characteristic; 0.020″ air gap; 10-11/32″ lg x 2-11/16″ wd x 4-19/32″ h; shaft 1/4″ dia x 1/2″ lg beyond bushing; 90 Invar plates, copper, nickel silver pl; 85.5° clockwise rotation; Mycalex ins; eight #6–32 mtg holes; incl 5 capacitor trimmers (C140 to C144), 5 fixed inductors L102A, L102B, L106C, L109D, L110E and 5 variable inductors, L103, L104, L107, L108, L111; tunes over 225–400 mc range; similar to F16–T–98077–2751 except for location of terminals on section C101E and added holes in housing. FDR pt #A1000229–1, dwg #D1000230	RF amplr tuning
C101A		p/o C101	
C101B		p/o C101	
C101C		p/o C101	
C101D		p/o C101	
C101E		p/o C101	
C102		TUNER, RF: air dielectric, plate meshing type; 4 sections; 43.5–14.3, 45.5–15, 43.4–14.3 and 35.2–12.2 mmf, split stators and balanced grounded rotor; SLF characteristic; 0.017″ air gap except 0.020″ in tripler action, 10-11/32″ lg x 2-11/16″ wd x 4-19/32″ h; shaft 1/4″ dia 15/32″ lg; 63 plates all Invar copper, nickel and silver pl; except one brass pl. 85.5° clockwise rotation, Mycalex ins. solder term; eight #6–32 mtg holes irregularly spaced; similar to F16–T–98077–2726 except for different type of shaft bearings, location of terminals on stator C102B and tapped holes in housing; FDR pt #A1000556, dwg #D1000232	Oscillator-multiplier tuning
C102A		p/o C102	
C102B		p/o C102	

C102C		p/o C102	
C102D		p/o C102	
C103	N16–EC–057142–0103	CAPACITOR, fixed: mica; 33 mmf ±10%, 500 vdcw; temp coefficient no specified limits; 29/64" dia x 1/16" thk body; one solder lug term; three 5/32" lg mtg tabs, spaced 120° apart; ERC type 600, FDR dwg #A1000387–2	1st rf amplr cathode bypass
C104		Same as C103	1st rf amplr cathode bypass
C105	N16–C–18659–4509	CAPACITOR, fixed: ceramic; 1000 mmf ±20%, 350 vdcw; negative temp coefficient 330, tolerance ±500 mmf/mf/deg C; ERM type 362, FDR dwg #A1003655	1st rf amplr AGC bypass
C106		Same as C103	2nd rf amplr cathode bypass
C107		Same as C103	2nd rf amplr cathode bypass
C108	N16–C–15368–5888	CAPACITOR, fixed: ceramic; JAN type CC21CK010C; 1 mmf ±0.25 mmf; 500 vdcw; 0±250 mmf/mf/deg C temp coefficient; spec JAN–C–20A; FDR pt #621477	1st rf amplr coupling
C109		Same as C108	1st rf amplr coupling
C110	N16–C–15400–5867	CAPACITOR, fixed: ceramic; JAN type CC21CK1R5C; 1.5 mmf ±0.25 mmf; 500 vdcw; 0±250 mmf/mf/deg C temp coefficient; spec JAN–C–20A; FDR pt #621478	2nd rf amplr coupling
C111		Same as C110	2nd rf amplr coupling
C112		Same as C105	1st rf amplr plate bypass
C113		Same as C105	2nd rf amplr AGC bypass
C114		Same as C105	2nd rf amplr plate bypass
C115		Same as C105	Mixer plate bypass
C116	N16–C–18657–8640	CAPACITOR, fixed: ceramic; 1000 mmf ±20%; 350 vdcw; unins; 0.520" lg x 1/4" across flats; one axial wire lead one end and #3–48 x 11/32" lg stud on other end; ERC 720B, FDR dwg #A1001081–1	Mixer grid bypass
C117	N16–C–28975–1601	CAPACITOR, fixed: mica; JAN type CM20C151J; 150 mmf ±5%, 500 vdcw; spec JAN–C–5; FDR pt #600182	Mixer plate tank
C118	N16–C–16051–3074	CAPACITOR, fixed: ceramic; 18 mmf ±1 mmf; 500 vdcw; neg. temp coefficient 150 (±250) mmf/mf/deg C; ERM type 721B, FDR dwg #A1003657–1	Mixer-tripler link resonating
C119	N16–EC–057142–0119	CAPACITOR, fixed: mica; 300 mmf ±5%; temp coefficient ±200 mmf/mf/deg C; 500 vdcw; button type; 0.450" dia x 0.070" thk; one 9/32" lg lug term; three 5/32" lg mtg tabs (gnd cont) spaced 120° apart; ERC type 600; FDR dwg #A1000444–1	Mixer plate tank
C120		Same as C105	Osc & 1st doubler plate bypass
C121	For replacement use N16–C–15988–1600	CAPACITOR, fixed: ceramic; JAN type CC21SH150K; 15 mmf ±10%; 500 vdcw; spec JAN–C–20A; FDR pt #620318	Oscillator tank balancing
C122		Same as C105	1st doubler grid test point filter

* Used interchangeably.

TABLE 8-2. TABLE OF REPLACEABLE PARTS (Cont)

REFERENCE DESIGNATION	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
C123		Same as C105	1st doubler plate bypass
C124		Same as C105	2nd doubler grid test point filter
C125		Same as C105	2nd doubler holding bias bypass
C126	N16-C-15625-4061	CAPACITOR, fixed: ceramic; JAN type CC21SH050C; 5 mmf ±.25 mmf; −330 +60 mmf/mf/deg C temp coefficient; spec JAN-C-20A; FDR pt #620273	2nd doubler grid tank balancing
C127		Same as C105	2nd doubler plate voltage bypass
C128		Same as C126	2nd doubler plate tank balancing
C129	N16-C-16533-1248	CAPACITOR, fixed: ceramic; JAN type CC21UJ470J; 47 mmf ±5%; 500 vdcw; spec JAN-C-20A; FDR pt #620604	2nd doubler coupling
C130		Same as C129	2nd doubler coupling
C131		Same as C105	Tripler grid bias test point filter
C132		Same as C105	Tripler holding bias test point filter
C133	N16-C-30167-1887	CAPACITOR, fixed: mica; 500 mmf ±10%, 500 vdcw; button type; 29/64" dia x 1/16" thk body; one solder lug term; three 5/32" lg mtg tabs spaced 120° apart; ERC #600, FDR dwg #A1000387-1	Tripler screen bypass
C134		Same as C133	Tripler screen bypass
C135		Same as C118	Tripler-mixer resonating link
C136		Same as C105	Tripler plate voltage bypass
C137		Same as C129	Oscillator coupling
C138		Same as C105	Tripler fil bypass
C139		Same as C133	Tripler fil bypass
*C140		CAPACITOR, variable: (integral with C101A)	1st rf amplr grid tank trimmer
*C141		CAPACITOR, variable: (integral with C101B)	1st rf amplr plate tank trimmer
*C142		CAPACITOR, variable: (integral with C101C)	2nd rf amplr grid tank trimmer
*C143		CAPACITOR, variable: (integral with C101D)	2nd rf amplr plate tank trimmer
*C144		CAPACITOR, variable: (integral with C101E)	Mixer grid tank trimmer
*C145		CAPACITOR, variable: (integral with C102C)	Tripler grid tank trimmer
*C146		CAPACITOR, variable: (integral with C102D)	Tripler plate tank trimmer
*C147		CAPACITOR, variable: (integral with C102B)	2nd doubler grid tank trimmer
*C148		CAPACITOR, variable: (integral with C102A)	Osc plate tank trimmer
C149		Same as C105	1st rf amplr fil bypass

C150		Same as C133	1st rf amplr fil bypass
C151		Same as C105	2nd rf amplr fil bypass
C152		Same as C133	2nd rf amplr fil bypass
C153	N16–C–30167–1876	CAPACITOR, fixed: mica; 500 mmf ±10%; temp coefficient ±200 mmf/mf/deg C; 500 vdcw; button type; 0.450" dia x 0.070" thk; one 9/32" lg lug term; three 5/32" lg mtg tabs and gnd cont, spaced 120° apart; ERC type 600; FDR dwg #A1000444–2	Mixer fil bypass
C154		Same as C105	Mixer fil bypass
C155		Same as C153	Osc-doubler fil bypass
C156		Same as C105	Osc-doubler fil bypass
C157		Same as C153	2nd doubler fil bypass
C158		Same as C105	2nd doubler fil bypass
C159	N16–C–29265–3006	CAPACITOR, fixed: mica; JAN type CM20D201J; 200 mmf ±5% 500 vdcw; spec JAN–C–5; FDR pt #600233	Crystal leads resonating
C160		Same as C116	DC blocking
C161	N16–EC–057142–0161	CAPACITOR, fixed: ceramic; 10 mmf ±1 mmf; 500 vdcw; neg temp coefficient 150 ±250 mmf/mf/deg C; ERM type 721B, FDR dwg #A1003657–2	Antenna tuning
C162		Same as C110	J101 decoupling
C201	N16–EC–057142–0201	CAPACITOR, fixed; ceramic; 2000/2000 mmf +30% −20%; 350 vdcw; unins; 1-3/16" lg x 1/4" dia; two radial wire lead term; one #4–40 thd 5/16" lg mtd stud on bottom; ELRC style CST, FDR dwg #A1003706–1	
C201A		p/o C201	1st if amplr AGC bypass
C201B		Not used	
C202		Same as C201	
C202A		p/o C202	1st if amplr screen bypass
C202B		p/o C202	1st if amplr plate bypass
C203		Same as C121	Scan amplr coupling
C204	N16–C–17085–7060	CAPACITOR, fixed: ceramic; JAN type CC26SL101K; 110 mmf ±10%; 500 vdcw; spec JAN–C–20A; FDR pt #621047	Scan output coupling
C205	N16–EC–057142–0205	CAPACITOR, fixed: ceramic; 7500 mmf ±20%; 350 vdcw; uninsulated; 1-3/16" dia; two radial wire lead term; one 4–40 thd 5/16" lg mtg studs on bottom; ELRC style CS–4, FDR dwg #A1018488–1	2nd osc plate bypass
C206		Same as C201	
C206A		p/o C206	Scan amplr screen bypass
C206B		p/o C206	Scan amplr cathode bypass

* Not a replaceable part; listed for reference only.

TABLE 8-2. TABLE OF REPLACEABLE PARTS (Cont)

REFERENCE DESIGNATION	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
C207		Same as C108	J201 decoupling
C208	N16-C-30114-4276	CAPACITOR, fixed: mica; JAN type CM20B471K; 470 mmf ±10%; 500 vdcw; spec JAN-C-5; FDR pt #600124	Osc-mixer coupling
C209		Same as C205	2nd mixer plate bypass
C210	N16-C-15528-5523	CAPACITOR, fixed: ceramic; JAN type CC21CJ030C; 3 mmf ±0.25 mmf; 500 vdcw; spec JAN-C-20A FDR pt #621432	Transformer coupling
C211		Same as C205	2nd if amplr cathode bypass
C212		Same as C201	2nd if amplr screen bypass
C212A		p/o C212	
C212B		p/o C212	
C213	N16-C-33622-5222	CAPACITOR, fixed: mica; JAN type CM35B103K; 10,000 mmf ±10%; 300 vdcw; spec JAN-C-5; FDR pt #601142	Input meter filter
C214		Same as C213	Input meter filter
C215		Same as C205	2nd if amplr plate bypass
C216		Same as C210	Transformer coupling
C217		Same as C205	3rd if amplr plate bypass
C218		Same as C201	
C218A		p/o C218	3rd if amplr screen bypass
C218B		Not used	
C219		Same as C205	3rd if amplr cathode bypass
C220	N16-C-29375-8076	CAPACITOR, fixed: mica; JAN type CM20B221K; 220 mmf ±10%; 500 vdcw; spec JAN-C-5; FDR pt #600120	AF det. load filter
C221		Same as C220	AF det. load filter
C222		Same as C205	AF det. cathode bypass
C223		Same as C213	Noise limiter time constant
C224		Same as C204	AF det. plate coupling
C225		Same as C205	AGC amplr screen bypass
C226		Same as C204	AGC amplr plate coupling
C227	N16-C-32646-6808	CAPACITOR, fixed: mica; JAN type CM35B472K; 4700 mmf ±10%; 500 vdcw; spec JAN-C-5; FDR pt #601138	Noise limiter output coupling
C228	N16-EC-057142-0228	CAPACITOR, fixed: paper; JAN type CP61B6EF504X; 500,000/500,000 mmf +40-15%; 600 vdc; spec JAN-C-25; FDR pt #640625	

C228A		p/o C228	Silencer filter
C228B		p/o C228	AGC filter
C229		Same as C205	AGC amplr plate bypass
C230		Same as C208	Silencer diode cathode filter
C231		Same as C213	AGC diode plate bypass
C232		Same as C213	Silencer diode plate coupling
C233		Same as C227	1st af amplr plate filter
C234	N16–C–31512–4608	CAPACITOR, fixed: mica; JAN type CM35B152K; 1500 mmf ±10%; 500 vdcw; spec JAN–C–5; FDR pt #601132	Audio filter
C235		Same as C201	
C235A		p/o C235	Regeneration suppressor
C235B		p/o C235	Regeneration suppressor
C236		Same as C227	2nd af amplr plate coupling
C237	N16–EC–057142–0237	CAPACITOR, fixed: electrolytic; JAN type CE52C700M; 2 sections; 70/70 mf; 250 vdcw; −20°C to +85°C temp range; spec JAN–C–62; FDR pt #660499	
C237A		p/o C237	AF output cathode bypass
C237B		p/o C237	150 volt filter
C238		Same as C213	Audio filter
C239		Same as C227	Audio filter
C240		Same as C213	Output meter filter
C241		Same as C213	Output meter filter
C242		Same as C213	Phone output filter
C243		Same as C213	Phone output filter
C244		Same as C205	J202 bypass
C245		Same as C205	AGC amplr B+ bypass
C246		Same as C205	105 volt bypass
C247		Same as C205	Scan B+ bypass
C301	N16–C–19892–7801	CAPACITOR, fixed: electrolytic; JAN type CB41B350Q; 35 mf; 400 vdcw; −20°C +85°C working temp range; spec JAN–C–62 FDR pt #660896	Filter
C302	N16–C–48841–9605	CAPACITOR, fixed: paper; JAN type CP61B1EF105V; 1 mf +20% −10% 600 vdcw; spec JAN–C–25; FDR pt #640528	Filter
C303		Same as C301	Filter
C304		Same as C302	Motor phasing

TABLE 8–2. TABLE OF REPLACEABLE PARTS (Cont)

REFERENCE DESIGNATION	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
C401	N16–C–46371–9609	CAPACITOR, fixed: paper; 250,000 mmf +20% –10%; 200 vdcw; hermetically sealed metal case; 1-13/16" lg x 3/4" dia; mineral oil filled and impr; 3/8" dia x 7/32" lg term at ea end w/#10–32 thd x 1/4" tapped hole; one side is internal gnd; tangential mtg strap w/o .201" dia mtg hole; SPR Cat #48P2, FDR dwg #A1003543	AC line filter
C402		Same as C401	AC line filter
C403	N16–C–31090–3800	CAPACITOR, fixed: mica; 1000 mmf ±10%; 500 vdcw; temp coef ±200 mmf/mf/deg C; button type; .450" dia x 0.085" thk; metal case; one lug term; 3 mtg tabs spaced 120° apart; ERC type 600, FDR dwg #A1000444–3	AC line filter
C404		Same as C403	AC line filter
C405		Same as C401	AC line filter
C406		Same as C401	AC line filter
C407		Same as C403	AC line filter
C408		Same as C403	AC line filter
E101	N16–S–34518–5501	SHIELD, electron tube: brass, nickel pl; rectangular; 2.36" lg x 0.870" wd x 2.093" h; friction mtg; twin tube shield; FDR pt #A1000420–1, dwg #A1000421	Shield for V101 and V102
E102		Not used	
E103		Same as E101	Shield for V103 and V104
E104		Not used	
E105	N16–S–34532–8760	SHIELD, electron tube: JAN type TS103U01; brass, nickel pl; 1-1/2" lg x 1.065" dia; bayonet mtg; spec JAN–S–28A; FDR pt #380003	Shield for V105
E106		Same as E105	Shield for V106
E107		Same as E105	Shield for V107
E108		Same as E101	Shield for V108 and V109
E109		Not used	
E110	N16–EE–057142–0110	BRUSH, electrical contact: #34 (.006") B&S ga hard beryllium copper, heat treated, silver pl; 0.455" lg x 0.312" wd; one end tapered; one #31 (.120") drill hole 0.156" from wider end; FDR dwg #A1000289	Sliding contact for trimmers in C101, C102
E111		INSULATOR SET: c/o E111A and E111B	Y201 lead feed-through
E111A	Listed for reference only	INSULATOR, bushing: glass melamine molded phenolic, ground finish; round shank, 13/32" lg x 3/16" OD x 0.101" ID; FDR dwg #A1001092	p/o E111
E111B	Listed for reference only	INSULATOR, bushing: glass melamine molded phenolic, ground finish; round shank 0.118" lg x 5/16" OD x 0.101" ID; FDR dwg #A1001093	p/o E111

E112		INSULATOR SET: c/o E112A and E112B	Y201 lead feed-through
E112A		Same as E111A	p/o E112
E112B		Same as E111B	p/o E112
E113		INSULATOR SET: c/o E113A and E113B	Second doubler grid test-point feed-through
E113A		Same as E111B	p/o E113
E113B		Same as E111B	p/o E113
E114		INSULATOR SET: c/o E114A and E114B	1st doubler B+ feed-through
E114A		Same as E111B	p/o E114
E114B		Same as E111B	p/o E114
E201	Shop manufacture	TERMINAL BOARD: glass cloth laminated thermosetting plastic; 8 solder post term; 3-13/16" lg x 3/4" wd x 3/32" thk; two .169" dia mtg holes 2-1/2" c to c; marked: "E201 and ckt symbols"; FDR pt #A1001280–1 dwg #A1001281	
E202	Shop manufacture	TERMINAL BOARD: glass cloth laminated thermosetting plastic; 11 solder post term; 4-1/2" lg x 3/4" wd x 3/32" thk; two .169" dia mtg holes 3.187" c to c; marked: E202 and ckt symbols; one 1/2" dia hole in center of board; FDR pt #A1001319 dwg #A1001320	
E203	Shop manufacture	TERMINAL BOARD: glass cloth laminated thermosetting plastic; 24 solder post term; 3-3/16 lg x 1-1/2" wd x 3/32" thk; two .120" dia mtg holes 3.487" c to c; marked: E203 and ckt symbols; FDR pt #A1001373, dwg #A1001374	
E204	Shop manufacture	TERMINAL BOARD: glass cloth laminated thermosetting plastic; 10 solder post term; 1-5/8" lg x 1-1/8" wd x 3/32" thk; two .169" dia mtg holes 1" c to c; marked: E204 and ckt symbols; one 7/16" lg x 1/8" a cut-out at one end; FDR pt #A1001376–1, dwg #A1001377	
E205	Shop manufacture	TERMINAL BOARD: glass cloth laminated thermosetting plastic; 32 solder post term; 5-1/16" lg x 1-1/2" wd x 3/32" thk; three .169" dia mtg holes 2.218" x 2.218" c to c; marked: E209 and ckt symbols; FDR pt #A1001380–1, dwg #A1001381	
E206	Shop manufacture	TERMINAL BOARD: glass cloth laminated thermosetting plastic; 18 solder post term; 2-7/8" lg x 1-1/2" thk; two .169" dia mtg holes 2.250" c to c; marked: E206 and ckt symbols; FDR pt #A1001325–1, dwg #A1002493	
E207	Shop manufacture	TERMINAL BOARD: glass cloth laminated thermosetting plastic; 22 solder post term; 3-1/2" lg x 1-1/8" wd x 3/32" thk; two .169" dia mtg holes 2.875" c to c; marked: E207 and ckt symbols; FDR pt #A1001322–1, dwg #A1001323	
E208	Shop manufacture	TERMINAL BOARD, glass cloth laminated thermosetting plastic; 6 solder post term; 2-15/16" lg x 1/2" wd x 1/8" thk; two .165" dia mtg holes 2.625" c to c; marked: E208, R265, 31, 32, 33, 34, 35, 36; FDR pt #A1000635–2, dwg #A1000636–2	
E209	Shop manufacture	TERMINAL BOARD: glass cloth laminated thermosetting plastic; 24 terminals, solder post type; 6-1/4" lg x 1-1/2" wd x 1/8" thk; four .169" dia mtg holes 5.875" x 1.125" c to c; marked: E209 and ckt symbols; FDR pt #A1017331–1, dwg #A1017333	

TABLE 8–2. TABLE OF REPLACEABLE PARTS (Cont)

REFERENCE DESIGNATION	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
E210		Not used	
E211		Not used	
E212	N16–K–700310–977	KNOB: round; black bakelite; for 1/4" shaft; white line; brass insert; 1-1/16" dia x 5/8" thk; FDR pt #A1001395–1, dwg #A1001396	S203 xtal-manual selector
E213	If required, will be procured by Navy Supply Activity on demand	TERMINAL STUD: breakdown voltage 3500 vac; one solder connection on top one on bottom; brass hot tin dipped bakelite body; 7/8" lg x 5/16" across flats o/a; mts by 1/4–24 thd bushing 1/4" lg; WIQ type FT5, FDR pt #363852	J201 feed-through
E214		Same as E213	J202 feed-through
E215		Same as E213	J203 feed-through
E216		Same as E213	J204 feed-through
E217	If required, will be procured by Navy Supply Activity on demand	TERMINAL STUD: breakdown voltage 22,000 vdc; one solder connection; brass hot tin dipped; bakelite body; 7/8" lg x 1/4" dia body 17/32" lg; mts by 4–40 thd brass insert; WIQ type #767, FDR pt #363850	Scan output terminal
E218	N16–S–34520–3864	SHIELD, electron tube: JAN type TS102U01; brass, nickel pl; 1-3/8" lg x 1.050" dia o/a; bayonet mtg; spec JAN–S–28A; FDR pt #380000	Shield for V201
E219		Same as E218	Shield for V202
E220		Same as E105	Shield for V203
E221		Same as E218	Shield for V204
E222		Same as E218	Shield for V205
E223		Same as E218	Shield for V206
E224		Same as E218	Shield for V207
E225		Same as E218	Shield for V208
E226		Same as E105	Shield for V209
E227	N16–S–34557–8351	SHIELD, electron tube: JAN type TS102U02; brass nickel pl; 1-3/4" lg x 1.050" dia; bayonet mtg; spec JAN–S–28A FDR pt #380001	Shield for V210
E301	Shop manufacture	TERMINAL BOARD: glass cloth laminated thermosetting plastic; 6 solder post term; 2-5/16" lg x 1/2" wd x 1/8" thk; two .169" dia mtg holes 2.625" c to c; marked E301 and 21, 22, 23, 24, 25, 26; FDR pt #A1000635–1, dwg #A1000636–1	
E302	Shop manufacture	TERMINAL BOARD: glass cloth laminated thermosetting plastic; 17 solder post term; 6-11/16" lg x 15/16" wd x 3/32" thk; three .169" dia mtg holes spaced 2.906" c to c; marked E302, R301, R302, R303, R309, R306, R307; FDR pt #A1000648–1	

E303	Shop manufacture	TERMINAL BOARD: glass cloth laminated thermosetting plastic; 15 solder post term; 7-7/16" lg x 1/2" wd x 1/8" thk; three .169" dia mtg holes spaced 3.375" apart; marked E303, term. numbered from 1 to 15; FDR pt #A1000633, dwg #A1000634	
E304	N16-S-34607-6039	SHIELD, electron tube: JAN type TS102U03; 2-1/4" lg x .930" dia; bayonet mtg; spec JAN-S-28A; FDR pt #380002	Shield for V302
E305		Same as E304	Shield for V303
E401		LOAD, dummy connector plug: one round male cont; straight; approx 1.356" lg x 27/64" dia o/a; 52 ohms impedance; cyl body, brass, silver pl; polystyrene insert; push-on type; contains JAN type RC20BF470K resistor; BuShips dwg RE49AA-399B except item 4; FDR dwg #A1022050A	Scan output termination
E501	N16-K-700344-505	KNOB: round; black phenolic; for 1/4" dia shaft; brass insert; 1-7/16" dia x 15/32" lg w/bakelite handle; two #6-32 Bristo set screws 120° apart; FDR pt #A100-1521, dwg #A1001522	C101/C102 tuning
E502	N16-K-700266-740	KNOB: round; black phenolic; for 3/16" dia shaft; brass insert; 5/8" dia x 17/32" lg; two #6-32 Bristo set screws 120° apart; FDR pt #A100153-1	Dial lock control
E503	N16-K-700277-350	KNOB: round; black phenolic; for 1/4" shaft; brass insert; 3/4" dia x 9/16" lg; two #6-32 Bristo set screws 120° apart; FDR pt #A1001526-1	Dimmer control
E504		Same as E212	Phone level control
E505	N17-C-77415-7611	CONTACT, case: 3" lg x 9/16" wd x 3/8" h; rt angle section #14 B&S ga 1/2 hard bronze sheet w/four #32 B&S beryllium copper spring inserts; two #30 (.128") tapped mtg holes 1-1/2" c to c; FDR pt #A1001548-1	Grounding contact
E506		Same as E505	Grounding contact
E507	N17-C-77417-8070	CONTACT, case: 12" lg x 9/16" wd x 3/8" h, rt angle section #14 B&S ga bronze sheet nickel pl w/sixteen #32 B&S ga beryllium copper spring inserts; seven #30 (.128") tapped mtg holes spaced 1-1/2" apart; FDR pt #A1001548-2	Grounding contact
E508		Same as E507	Grounding contact
F201	G17-F-16302-100	FUSE, cartridge: 2 amp, 250v; instantaneous; glass body; ferrule term; BUS 3AG; FDR pt #880043	A-C power
F202		Same as F201	A-C power
F203		Same as F201	Spare
H101	Shop manufacture	WASHER, spring: round, plane of washer bent on 13/16" rad. cad pl. spring steel 0.016" thk; 0.257" ID x 7/16" OD x 0.047" thk; SH 3544-14, FDR dwg #A1000235	Thrust spring for capacitor shaft
H102		Same as H101	Thrust spring for capacitor shaft
H501		TOOL, alignment: insulated; nylon 4" lg o/a x 5/16" across flats; 1/8" x 0.022" screw driver tip on one end spline tip to fit #6 fluted socket head screw on other end; both tips SS; similar to N16-T-751468-732 except nylon; FDR pt #FRA-20347-1-1	Alignment
H502	N16-EH-057142-0202	TOOL, alignment: nylon cast rod, Dupont grade FM10001, prod #44 (.086") brass rod cad pl; 3-25/32" lg x 9/16" dia; prod on one side, 9" lg #20 stranded test lead w/alligator clip on other side; FDR pt #A1019492-1, dwg #B1021616	Alignment loading

TABLE 8–2. TABLE OF REPLACEABLE PARTS (Cont)

REFERENCE DESIGNATION	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
H503	Shop manufacture	HANDLE: for panel; brass, cad pl, painted grey; 4-1/4" lg x 11/16" wd x 1-1/8" h; grip 4-1/4" lg x 3/16" wd x 15/32" thk; two #10–32 thd 1/4" a hole 3-9/16" c to c; FDR dwg #A1001518	Panel handle
H504		Same as H503	Panel handle
H505		WRENCH: for #6 fluted socket set screw; steel chrome zinc pl; one arm 21/32" lg, other 1-27/32" lg; FDR pt #495583	Knob set screws
I501	G17–L–6297	LAMP, incandescent: 6.3v, 0.15 amp; bulb T–3-1/4 clear; miniature bayonet base; GE #47, FDR pt #710013	Dial light
I502		Same as I501	Dial light
I503	G17–L–6806–130	LAMP, glow: 105–125v, 1/25w; bulb T–3-1/4 clear; miniature bayonet base; GE NE–51, FDR pt #715012	Crystal control
J101	N17–C–73108–1267	CONNECTOR, receptacle: JAN type UG–290/U; coax; one round cont; 52 ohms impedance; approx 3/4" dia x 3/4" lg; FDR pt #755317	18.6 Mc input
J201		Same as J101	1.775 Mc input
J202	N16–EJ–057142–0202	CONNECTOR, receptacle: one female, round contact; straight; pin type connector, white nylon; 3/4" lg x 3/8" dia; DC breakdown 11,000 v mating pin .081" dia; mts in 17/64" dia mtg hole by 1/4–32" thd shank and hex nut; JON cat #105–601–1, FDR pt #749396	Oscillator test point
J203		Same as J202	Detector test point
J204		Same as J202	AGC test point
J205		Same as J202	B+ test point
J401	N17–C–72604–1522	CONNECTOR, receptacle: AN type AN–3102A–14S–7P; 3 round male cont; straight; 3/8" max cable opening; insert per MIL–C–5015; cyl metal body 3/4" dia x 35/64" lg; mtg fl 1-1/32" x 1-3/32" w/4 mtg holes .120" dia spaced 39/32" c to c; FDR pt #752191	AC power input
J402	N17–C–72610–5429	CONNECTOR, receptacle: AN type AN–3102A–14S–2P, 4 round male cont; straight; 7/8–20 thd cyl metal body 3/4" dia x 3-54/64" lg; mtg fl 1-3/32" x 1-3/32" w/4 mtg holes .120" dia spaced 29/32" x 29/32" c to c; FDR pt #752188	Audio output
J403	N17–C–73108–1262	CONNECTOR, receptacle: MIL type UG–291/U; one round female cont; straight; 52 ohms impedance; 1-1/32" lg x 3/4" wd x 3/4" h; spec MIL–C–3608; FDR pt #755318	Scan output
J404	N17–C–73109–4976	CONNECTOR, receptacle: one round female cont; 1" sq x 1-1/8" lg o/a; cyl metal body; polystyrene insert; sq mtg fl w/four 0.125" dia hole 23/32" x 23/32" c to c; spec JAN–C–71; FDR pt #755073	Antenna connection
J405	N17–C–73194–4231	CONNECTOR, receptacle: 4 round female cont; pol; straight type; 1-3/4" lg x 1-1/2" wd x 3/4" h; cont rated 10 amp; 500v; rectangular phenolic base; round aluminum body; anodized mtd by four holes 0.189" dia 1-3/8" x 1-1/8" c to c; 4 solder lug term; term marked 71, 68, 70, 69; IPC 7450–S–2, FDR dwg #A1003542	Power and audio input

J406	N17-C-73108-6037	CONNECTOR, receptacle: AN type UG-348/U; one female round cont; straight 1" sq x 0.957" lg; 4 mtg holes 0.125" dia 0.718" x 0.718" c to c; IPC 7350, FDR pt #755375	Scan output inter-unit connector
J407		Same as J406	Antenna inter-unit connector
J501	N17-J-39248-4423	JACK, telephone: short frame; tip and sleeve; incl hex nut, metal washer and phenolic washer; per BuShips dwg RE49AA195; FDR pt #757042	Phone output
L101	N16-S-3281-1004	SHIELD, antenna: coupling; 90° elbow 3/16" OD x 0.025" wall seamless round copper tubing, silver pl; bent on 1/4" rad; one end flared to 9/32" dia; 31/32" lg to flared end, 13/64" lg to plain end; FDR dwg #A1003744	Antenna coupling
*L102		INDUCTOR: (integral with C101A)	1st rf amplr grid tank
*L103		INDUCTOR: (integral with C101A)	1st rf amplr grid tank trimmer
*L104		INDUCTOR: (integral with C101B)	1st rf amplr plate tank trimmer
*L105		INDUCTOR: (integral with C101B)	1st rf amplr plate tank
*L106		INDUCTOR: (integral with C101C)	2nd rf amplr grid tank
*L107		INDUCTOR: (integral with C101C)	2nd rf amplr grid tank trimmer
*L108		INDUCTOR: (integral with C101D)	2nd rf amplr plate tank trimmer
*L109		INDUCTOR: (integral with C101D)	2nd rf amplr plate tank
*L110		INDUCTOR: (integral with C101E)	Mixer grid tank
*L111		INDUCTOR: (integral with C101E)	Mixer grid tank trimmer
*L112		INDUCTOR: (integral with C102D)	Tripler plate tank trimmer
*L113		INDUCTOR: (integral with C102D)	Tripler plate tank
L114		COIL, RF: oscillator; 1 wnd, single layer wnd; unshielded; 14 turns 20 #AWG bare tinned copper wire, tapped at 5-11/16 turns from mtg base, inductance 1.4 mh; 1-25/32" lg x 17/32" wd; ceramic form; powdered iron core w/slotted brass shaft for scdr adj; two #4-40 mtg holes in base; 2 solder lug term, wire loop at tap; FDR pt #A1003798-1, dwg #B1003799	Oscillator plate tank
L114A	N16-C-600701-121	Core, adjustable tuning: #6-32 cad pl brass stud imbedded in 0.309" dia x 1/2" lg cylinder of gray iron core material; 1-3/8" lg x 1/32" wd x 1/64" deep; FDR dwg #A1003750-2	p/o L114 tuning adj
L115		TRANSFORMER, RF: 40-70 mc frequency range; 2 space wound; single layer wnd; one grid coil 6 turns of #20 AWG bare tinned soft copper wire tapped at 2-7/8 wnd, plate 5-3/8 turns; adj powdered iron coil; scdr adj; unshielded; 1-51/64" lg x 9/16" wd x 1-1/16" h; two #4-40 mtg holes on 3/4" c to c in base flange; 3 solder lug term; FDR pt #A1003822-1, dwg #B1003823	1st doubler rf transformer
L115A	N16-C-600701-120	CORE, adjustable tuning: #6-32 cad pl brass stud in 0.309" dia x 3/8" lg cylinder of gray iron core material, 1-1/4" lg x 1/32" wd x 1-64" d slot in one end, 0.075" x 1/16" d slot in other end; FDR dwg #A1003750-1	p/o L115

* Not a replaceable part; listed for reference only.

TABLE 8–2. TABLE OF REPLACEABLE PARTS (Cont)

REFERENCE DESIGNATION	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
L116		COIL, RF: choke; 1 wnd, single layer wnd; unshielded; 0.58 uh at 100 ma dc; 0.01 ohms dc resistance; 9 turns #20 wire tapped 5 turns from mtg end; 1-51/64" lg x 1-5/16" wd x 9/16" h o/a; bakelite form; air core; two #4–40 thd mtg holes 3/4" c to c; 2 solder lug and one wire loop term 1/2" lg; FDR pt #A1003828–1, dwg #B1003829	2nd doubler plate coil
L117		COIL, RF: choke; 1 wnd, single layer wnd; unshielded; 0.09 uh at 25 and 50 mc, 100 ma dc, 0.007 ohms dc resistance; 3 turns #20 wire ct; 2-1/4" h x 1-1/16" wd 9/16" d o/a; bakelite form, adj brass core; scdr adj on bottom; two #4–40 thd mtg holes 3/4" c to c; 2 solder lug term; FDR pt #A1003850–1, dwg #B1003851	Tripler grid tank
L117A	N16–C–600701–137	CORE, adjustable tuning: 5/16" dia x 1-3/8" lg brass rod turned to 0.309" dia for 1/2" from one end and #6–32 x 7/8" lg thd from other end; scdr slots in both ends; all silver pl; FDR dwg #A1003852	p/o L117
L118	N16–C–71585–4777	COIL, RF: 3-3/16" lg x 0.140" OD coax cable; 0.032" dia inner copper conductor; silver pl copper tube outer conductor; polyethylene dialectric; ins stripped 5/16" from ea end FDR dwg #A1003745	Tripler-mixer coupling line
L119	N16–C–600701–118	COIL, RF: 25/32" lg x 3/16" dia brass rod silver pl, with #10–32 x 13/32" lg thd on one end, remainder turned to 0.150" dia; 1/32; wd x 1/16" d screwdriver slot in thd end, #3–48 x 3/8" d axial hole in other end; FDR dwg #A1003746	Tripler-mixer link stud
L120		Same as L119	Mixer-tripler link stud
L121		Same as L119	Antenna coupling stud
L122	N17–T–68163–6371	TRANSFORMER, IF: interstage; pri 7-1/4 turns, secd 5/16 turn of #26 bare tinned copper wire; unshielded; 1-31/64" lg x 9/16" wd x 1-1/16" h; bakelite coil form, powdered iron core; pri and secd tuned by tuning slug; two #4–40 tap mtg holes 3/4" c to c; 4 solder lug term; FDR pt #A1003748–1, dwg #B1003749	Mixer plate coil
L122A		Same as L115A	L122 u/w tuning adj
L123	N16–C–72793–6430	COIL, RF: choke; single wnd, single layer wnd; 27 turns #30 sc enameled copper magnet wire; 1.2 uh, 0.133 ohms dc resistance; unshielded ;11/64" dia x 1/2" lg; 1-1/2" lg axial wire leads at ea end; FDR pt #A1003037–1, dwg #A1003038	Heater cathode capacitor resonating
L201	N16–C–72909–4533	COIL, RF: 3 uh ±5%, 0.255 ohms ±10% dc resistance; 45 turns #30 AWG single enamel copper magnet wire; close wound; unshielded; molded bakelite form; air core; 5/8" lg x 13/64" dia; 2 axial wire lead term; term mtg; FDR pt #A1003873–1, dwg #A1003874	B+ filter
L202		Same as L201	Oufput meter filter
L203		Same as L201	Output meter filter
L204		Same as L201	Phone output filter
L205		Same as L201	Phone output filter
L206		Same as L201	B+ filter

L301	N16–R–29693–5271	REACTOR: filter choke; 12 hy; hum-bucking tap at 11.4% of total 5700 turns of #31E wire; 145 ma; 350 ohms dc resistance; 1600 v rms test; enclosed metal case; 2-11/16″ lg x 2-9/16″ wd x 2-3/16″ h; four #8–32 x 7–16″ lg mtg studs 2″ x 1-7/8″ c to c; FDR spec #RC 8113–1	Filter
L401	N16–C–74458–4712	REACTOR: choke; 3 pie universal wnd, 1 wnd; unshielded; 1.26 mh ±10% at 1.5 amp dc, 1.12 ohms dc resistance; ea pie wnd w/80 turns #22 AWG dc wire, 240 turns total; 1-11/16″ lg x 1-1/2″ dia; iron core; form 5/8″ dia x 1-11/16″ lg; 2 mtg feet ea w/one #6–32 thd mtg hole 31/32″ c to c; 2 solder lug term; Q max impr; FDR pt #A1003452–1, dwg #A1003453	AC line filter
L402		Same as L401	AC line filter
L403	N16–C–72730–3773	COIL, RF: choke; 1 wnd, single layer wnd; unshielded; 0.339 uh at 10 and 20 mc at 2 amp dc, 0.013 ohm dc resistance; 7-1/2 turns #22E wire, 1-3/8″ lg x 3/8″ dia; phenolic form and core; one #6–32 thd mtg hole in one end; 2 solder lug term; FDR pt #A1003458–1, dwg #A1003459	AC line filter
L404		Same as L403	AC line filter
L405	N16–C–74411–7351	REACTOR: filter choke; 1 sect, 3 pie wnd; 1.08 mh ±10% at 300 ma dc; 1.96 ohms dc resistance; 100v rms test; open frame; 3 pie w/70 turns #26 AWG dc wire ea pie; 1-11/16″ lg x 1″ dia; 2 mtg feet ea w/#6–32 tapped holes 31/32″ c to c; FDR pt #A1003460–1 dwg #A1003461	Audio output filter
L406		Same as L405	Audio output filter
L407		Same as L403	AC line filter
L408		Same as L403	AC line filter
M501	N17–M–19255–1051	AMMETER: JAN type MR25W001DCMA; dc milliammeter; 0 to 1 ma; approx 105 ohms resistance; 2-1/2″ dia flush bakelite case; w/special shield per WS #D–116402; spec JAN–I–6; FDR pt #720361	Input meter
M502	N17–M–22724–6701	METER, audio level: ac rect type; range −10 to 0 + 20 db; round plastic flush case 2-1/2″ dia; 30 scale divisions, black numerals white background; 5% accuracy; for use across 600 ohms source; reference level 6 mw; aluminum shield; WS type 506, FDR pt #720362	Output meter
O101		DRIVE, capacitor: c/o spur gear on shaft in sand-cast aluminum frame; gear 64 teeth, 1.041″ OD x 1″ pitch dia, 64 diametrical pitch, 0.187″ thk, 20° pressure angle; hub ss bearing bronze; ss shaft 1/4″ dia x 1″ lg; 3-1/4″ lg x 1-1/32″ wd x 1-9/16″ h o/a; three 0.189″ dia mtg holes located in line 0.500″ and 2.688″ c to c; FDR pt #A1001133–1, dwg #B1001156	Synchronizing drive for osc and rf tuning
O102	G77–B–999–75008–0100	BALL BEARING, locking: spherical; 1/8″ dia; type 440, grad I; SS; STSB type 440, FDR dwg #A1000244	Inductance trimmer locking
O103	N16–G–432816–277	GEAR, spur: split gear; spring-loaded non-backlash type; 0.429″ thk incl hub; brass gear 128 teeth, 64 diametrical pitch; 20° pressure angle, 2″ pitch dia; two #62–32 radial set screws holes 90° apart; FDR pt #A1001132–1, dwg #A1000553	Capacitor drive
O104		Same as 0103	Capacitor drive
O105	N17–S–38251–1015	SHIELD, connector: brass, silver pl; rectangular shape; 1″ lg x 1″ wd x 1/2″ h; four #18 drill mtg holes 0.718″ x 0.718″ c to c; FDR dwg #A1001717	Shield for P101

TABLE 8–2. TABLE OF REPLACEABLE PARTS (Cont)

REFERENCE DESIGNATION	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
O201	N16–C–300798–866	CLAMP, electrical: SS; one strap type fastening device; 2.275″ dia w/strap open 1.425″ strap closed o/a, 1-3/8″ ID, 15/16″ h; one mtg hole for #10 screw in mtg bkt; BHE 926C–3, FDR dwg #A1000640–3	Tube clamp
O202	N16–M–60906–8018	BRACKET: JAN type CP06SA6; for capacitor mtg; "U" shaped spade bkt; 2-3/4″ lg x 49/64″ wd x 1-5/8″ h; two #6–32 thd mtg studs 1-9/16″ c to c; spec JAN–C–25; FDR pt #384011	Capacitor mounting
O203	If required, will be procured by Navy Supply Activity on demand	CLIP, electrical: phosphor bronze; nickel pl; 1.107″ lg x 5/16″ wd x .014″ thk; .048″ rad of four; two #30 (.128″) drill mtg holes .312″ c to c; FDR dwg #A1002312	Bristol key mounting
O204		Same as O105	Shield for P201
O301		Same as O202	Capacitor mounting
O302		Same as O202	Capacitor mounting
O303		CLAMP, electrical: SS; one strap type fastening device; 2.5745″ dia w/strap open, 1.775″ dia w/strap closed; 1.625″ ID 5/8″ h; one mtg hole for #10 screw in mtg bkt; BHE 926H–4; FDR dwg #A1000640–2	Tube clamp for V301
O304		BEARING, ball: single row radial; double shield; 7 mm bore, 22 mm OD, 5 mm wd; 7 balls 5/32″ dia; ND 77037, FAF 37KDD	Bearing for BL301 (EAD)
O305		BEARING, ball: single row radial; double shield; 1/8″ dia bore, 3/8″ OD, 5/32″ wd; 7 balls 1/16″ dia; ND 77R2	Rear bearing for BL301 (EAD)
O306		Same as O304	Front bearing for BL301 (AAP)
O307		BEARING, ball: single row radial; double shield; 4 mm bore, 16 mm OD; 5 mm wd; 8 balls 3/32″ dia, ND 77034, FAF 34KDD	Rear bearing for BL301 (AAP)
O308		BEARING, ball; single row radial; double shield; 1/4″ bore, 3/4″ OD, 9/32″ wd; 6 balls 5/32″ dia; FAF S1KDD	Front bearing for BL301 (AAGB)
O309		BEARING, ball: single row radial; double shield; 3–16″ bore, 1/2″ OD, 5 mm wd; 7 balls 3/32″ dia; FAF 33KDD5	Rear bearing for BL301 (AAGB)
O401	N17–S–250051–153	COVER, electrical connector: JAN type UG–177/U; brass, silver pl; 3/4″ lg x 1″ wd x 1″ h; four 0.125″ dia mtg holes 23/32″ x 23/32; c to c; FDR pt #755203	Shield for J404
O402		Same as O401	Shield for J404
O403		Same as O105	Shield for J406
O404		Same as O105	Shield for J407
O405	N17–C–70328–1545	CLAMP, electrical: AN type 3057–6; for 1/2″ max material dia; 1-5/16″ lg x 15/16″ dia o/a, 3/4″–20 thd; FDR pt #383050	u/w P401
O406		Same as O405	u/w P402

O501	If required, will be procured by Navy Supply Activity on demand	COVER, telephone jack: steel, cad pl drill black enamel finish; 1-1/32" lg x 13/16" wd x 5/16" thk; .386" dia hole in base for mtg on bushing of jack; FDR dwg #A1001544	Cover for J501
O502		DRIVE, dial: 1:20 speed reduction drive; w/automatic stop at completion of 19th revolution of dial; w/dial lock; 5-1/2" lg x 3" wd x 2-3/16" d; 3 mtg holes irreg spaced; FDR pt #A1000513–1, dwg #C1000514	Tuning drive for C101
O503	N17–C–98378–2225	COUPLING, flexible: comprises a driven arm (0503A) w/hub and a drive arm (0503B) w/hub; arms ea #14 (0.064") B&S ga 1/2 hard nickel pl brass strip	Coupling dial drive to preselector
O503A	Listed for reference only	COUPLING, arm: 1/4" ID x 1/2" OD hub staked to radial arm carrying drive pin; 1-25/32" lg x 9/16" wd x 19/32" h; FDR pt #A1001684, dwg #A1001685	p/o 0503
O503B	Listed for reference only	COUPLING, arm: 1/4" ID x 1/2" OD hub; staked to radial arm slotted along ctr line to receive pin on drive arm; 1-13/16" lg x 9/16" wd x 11/32" h; FDR pt #A1001689, dwg #A1001690	p/o 0503
O504		CLEANER ELEMENT, air: cartridge type; aluminum screen wetted in oil; 3-1/2" h x 4" wd x 3/4" thk; aluminum frame; mts in frame; AMA type P–56A; FDR dwg #B1002066	Dust filter
O505		Same as O504	
P101	N17–C–73408–7101	CONNECTOR, receptacle: JAN type UG–347/U; coaxial; 1 round male contact; 1" lg x 1" wd x 0.958" h; per BuShips dwg RE49F488B; FDR pt #755374	Antenna inter-unit connection
P201		Same as P101	Scan output inter-unit connection
P301	N17–C–73487–7175	CONNECTOR, receptacle: 4 round male cont; polarized; straight type; 1-3/4" lg x 1-1/2" wd x 11/16" h; cont rated 10 amp, 500v; rectangular phenolic base; round aluminum body, anodized; mtd by 4 holes 0.154" dia 1.375" x 1-1/8" c to c; IPC 7450–S–1 w/7455 shell, FDR dwg #A1003443	Power and audio input
P401	N17–C–70328–1515	CONNECTOR, plug: AN type AN–3106A–14S–7S; 3 round female cont; straight; metal body; 2-3/32" lg x 1-1/16" dia o/a incl clamp; 3/8" dia cable opening; FDR pt #A1003720–1, dwg #A1003721–1	For ac power input cable
P402	N17–C–70334–5473	CONNECTOR, plug: AN type AN–3106A–14S–2S; 4 round female cont; straight metal body; 2-3/32" lg x 1-1/16" dia incl cable clamp; 3/8" dia cable opening; FDR pt #A1003720–2, dwg #A1003721–2	Audio output
P403	N17–C–71408–3241	CONNECTOR, plug: MIL type UG–88/U; coax, one round male contact; straight; spec MIL–C–3608; FDR pt #755104	Scan output
P404	N17–C–71416–2550	CONNECTOR, plug: coaxial; JAN type UG–21B/U; 1 round male cont; straight; metal body 1-3/4" lg x 13/16" dia; spec JAN–C–71; FDR pt #755028	Antenna input
R101	N16–R–50633–811	RESISTOR, fixed: comp; JAN type RC20BF104K; 100,000 ohms ±10%; 1/2 w; spec JAN–R–11; FDR pt #500467	1st rf amplr AGC filter
R102	N16–R–50372–811	RESISTOR, fixed: comp; JAN type RC20BF223K; 22,000 ohms ±10%; 1/2 w; spec JAN–R–11; FDR pt #500459	1st rf amplr screen dropping
R103		Same as R102	1st rf amplr screen dropping
R104	N16–R–50067–231	RESISTOR, fixed: comp; JAN type RC30BF332K; 3300 ohms ±10%; 1 w; spec JAN–R–11, FDR pt #500715	1st rf amplr plate voltage dropping
R105		Same as R101	2nd rf amplr AGC filter

TABLE 8–2. TABLE OF REPLACEABLE PARTS (Cont)

REFERENCE DESIGNATION	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
R106		Same as R102	2nd rf amplr screen dropping
R107		Same as R102	2nd rf amplr screen dropping
R108		Same as R104	2nd rf amplr plate dropping
R109	N16–R–50822–811	RESISTOR, fixed: comp; JAN type RC20BF474K; 470,000 ohms ±10%; 1–2 w; spec JAN–R–11; FDR pt #500475	Mixer grid leak
R110	N16–R–50480–811	RESISTOR, fixed: comp; JAN type RC20BF473K; 47,000 ohms ±10%; 1/2 w; spec JAN–R–11; FDR pt #500463	Mixer plate dropping
R111	N16–R–49624–431	RESISTOR, fixed: comp; JAN type RC20BF151J; 150 ohms ±5%; 1/2 w; spec JAN–R–11; FDR pt #500295	Oscillator cathode resistor
R112	N16–R–49238–811	RESISTOR, fixed: comp; JAN type RC20BF100K; 10 ohms ±10%; 1/2 w; spec JAN–R–11; FDR pt #500419	Oscillator damping resistor
R113	N16–R–50013–231	RESISTOR, fixed: comp; JAN type RC30BF222K; 2200 ohms ±10%; 1 w; spec JAN–R–11; FDR pt #500713	Oscillator plate dropping
R114	N16–R–50336–811	RESISTOR, fixed: comp; JAN type RC20BF153K; 15,000 ohms ±10%; 1/2 w; spec JAN–R–11; FDR pt #500457	1st doubler grid leak
R115		Same as R101	1st doubler grid isolation
R116		Same as R111	1st doubler cathode resistor
R117		Same as R114	2nd doubler grid leak
R118		Same as R101	2nd doubler grid isolation
R119	N16–R–49967–811	RESISTOR, fixed: comp; JAN type RC20BF152K; 1500 ohms ±10%; 1/2 w; spec JAN–R–11; FDR pt #500445	2nd doubler plate dropping
R120	N16–R–50552–811	RESISTOR, fixed: comp; JAN type RC20BF683K; 68,000 ohms ±10%; 1/2 w; spec JAN–R–11; FDR pt #500465	Tripler grid leak
R121		Same as R101	Tripler grid isolation
R122		Same as R102	Tripler screen dropping
R123		Same as R102	Tripler screen dropping
R124		Same as R104	Tripler plate dropping
R125		Same as R113	1st doubler plate resistor
R126	N16–R–49769–811	RESISTOR, fixed: comp; JAN type RC20BF471K; 470 ohms ±10%; 1/2 w; spec JAN–R–11; FDR pt #500439	1st rf amplr screen decoupling
R127		Same as R126	2nd rf amplr screen decoupling
R128	N16–R–49427–811	RESISTOR, fixed: comp; JAN type RC20BF470K; 47 ohms ±10%; 1/2 w; spec JAN–R–11; FDR pt #500427	18.6 mc input termination

R129		Same as R112	Parasitic suppressor
R201	N16–R–50129–811	RESISTOR, fixed: comp; JAN type RC20BF472K; 4700 ohms ±10%; 1/2 w; spec JAN–R–11; FDR pt #500451	1st if amplr AGC decoupling
R202	N16–R–49661–811	RESISTOR, fixed: comp; JAN type RC20BF221K; 220 ohms ±10%; 1/2 w; spec JAN–R–11; FDR pt #500435	Scan amplr cathode resistor
R203		Same as R101	Scan amplr grid leak
R204	N16–R–50012–811	RESISTOR, fixed: comp; JAN type RC20BF222K; 2200 ohms ±10%; 1/2 w; spec JAN–R–11; FDR pt #500447	Scan amplr B+ dropping resistor
R205	N16–R–50282–811	RESISTOR, fixed: comp; JAN type RC20BF103K; 10,000 ohms ±10%; 1/2 w; spec JAN–R–11; FDR pt #500455	1st if amplr screen dropping
R206		Same as R201	1st if amplr plate dropping
R207		Same as R128	
R208	N16–R–49841–811	RESISTOR, fixed: comp; JAN type RC20BF681K; 680 ohms ±10%; 1/2 w; spec JAN–R–11; FDR pt #500441	Scan amplr plate resistor
R209		Same as R102	2nd osc grid leak
R210		Same as R101	J202 decoupling
R211		Same as R204	2nd mixer cathode resistor
R212		Same as R201	2nd mixer plate decoupling
R213		Same as R201	2nd if amplr AGC decoupling
R214		Same as R205	2nd if amplr screen dropping
R215		Same as R204	Input meter divider
R216	N16–R–49940–811	RESISTOR, fixed: comp; JAN type RC20BF122K; 1200 ohms ±10%; 1/2 w; spec JAN–R–11; FDR pt #500444	Input meter filter
R217		Same as R216	Input meter filter
R218		RESISTOR, variable: comp; JAN type RV3ATSA502A; 5000 ohms ±10%; 1/2 w; A taper; slotted shaft 1/2" lg x 1/4" dia; spec JAN–R–94; FDR pt #580285	Input meter balancing
R219		Not used	
R220	N16–R–50066–811	RESISTOR, fixed: comp; JAN type RC20BF332K; 3300 ohms ±10%; 1/2 w; spec JAN–R–11; FDR pt #500449	2nd if amplr plate decoupling
R221		Same as R202	3rd if amplr cathode resistor
R222		Same as R114	3rd if amplr screen dropping
R223		Same as R220	3rd if amplr plate decoupling
R224		Same as R120	Input meter divider
R225	N16–R–49922–811	RESISTOR, fixed: comp; JAN type RC20BF102K; 1000 ohms ±10%; 1/2 w; spec JAN–R–11; FDR pt #500443	Input meter balancing

TABLE 8-2. TABLE OF REPLACEABLE PARTS (Cont)

REFERENCE DESIGNATION	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
R226		Same as R120	AF detector load
R227		Same as R110	AF detector load
R228	N16-R-50975-811	RESISTOR, fixed: comp; JAN type RC20BF105K; 1 megohm ±10%; 1/2 w; spec JAN-R-11; FDR pt #500479	Noise limiting acceleration
R229		Same as R114	AF detector cathode
R230		Same as R109	AGC amp grid leak
R231		Same as R228	Noise limiter diode cathode
R232		Same as R228	Noise limiter plate divider
R233		RESISTOR, variable: comp; JAN type RV3ATSA204A; 200,000 ohms ±10%; 1/2 w; A taper; slotted shaft 1/2" lg x 1/4" dia; spec JAN-R-94; FDR pt #580283	IF gain control
R234		Same as R110	T206 primary loading
R235		Same as R110	Audio filter
R236		Same as R109	Audio filter
R237	N16-R-50893-431	RESISTOR, fixed: comp; JAN type RC20BF684J; 680,000 ohms ±5%; 1/2 w; spec JAN-R-11; FDR pt #500383	Silencer diode decoupling
R238	N16-R-51037-431	RESISTOR, fixed: comp; JAN type RC20BF185J; 1.8 megohms ±5%; 1/2 w; spec JAN-R-11; FDR pt #500393	Silencer B+ divider
R239		Same as R201	AGC amplr screen dropping
R240	N16-R-50551-431	RESISTOR, fixed: comp; JAN type RC20BF683J; 68,000 ohms ±5%; 1/2 w; spec JAN-R-11; FDR pt #500359	AGC diode load
R241	N16-R-49580-811	RESISTOR, fixed: comp; JAN type RC20BF101K; 100 ohms ±10%; 1/2 w; spec JAN-R-11; FDR pt #500431	B— divider
R242		Same as R241	B— divider
R243	N16-R-50281-431	RESISTOR, fixed: comp; JAN type RC20BF103J; 10,000 ohms ±5%; 1/2 w; spec JAN-R-11; FDR pt #500339	AGC diode load divider
R244	N16-R-49365-485	RESISTOR, fixed: comp; JAN type RC42BF330K; 33 ohms ±10% 2 w; spec JAN-R-11; FDR pt #5002287	B— bleeder
R245		Same as R101	AGC filter
R246	N16-R-50759-811	RESISTOR, fixed: comp; JAN type RC20BF334K; 330,000 ohms ±10%; 1/2 w; spec JAN-R-11; FDR pt #500473	Silencer diode plate load
R247	N16-ER-057142-0247	RESISTOR, variable; comp; JAN type RV3ATSA253A; 25,000 ohms ±10%; 1/2 w; A taper; slotted shaft 1/2" lg x 1/4" dia; spec JAN-R-94; FDR pt #580284	Silencer control
R248		Same as R114	Silencer plate divider

R249	N16–R–50417–811	RESISTOR, fixed: comp; JAN type RC20BF333K; 33,000 ohms ±10%; 1/2 w; spec JAN–R–11; FDR pt #500461	Silencer plate divider
R250	N16–R–51020–811	RESISTOR, fixed: comp; JAN type RC20BF155K; 1.5 megohms ±10%; 1/2 w; spec JAN–R–11; FDR pt #500481	1st af amplr grid AGC divider
R251		Same as R228	1st af amplr grid AGC divider
R252		Same as R120	"Align" input meter load
R253		Same as R120	1st af amplr plate load
R254		Same as R101	Audio filter
R255	N16–ER–057142–0255	RESISTOR, variable: comp; JAN type RV3ATSA504C; 500,000 ohms ±10%; 1/2 w; "C" taper; slotted shaft 1/2" lg x 1/4" dia; spec JAN–R–94; FDR pt #580283	AF gain control
R256		Same as R225	2nd af amplr cathode resistor
R257	N16–R–50678–811	RESISTOR, fixed: comp; JAN type RC20BF154K; 150,000 ohms ±10%; 1/2 w; spec JAN–R–11; FDR pt #500469	2nd af amplr plate load
R258		Same as R109	AF output grid leak
R259	N16–R–49706–811	RESISTOR, fixed: comp; JAN type RC20BF331K; 330 ohms ±10%; 1/2 w; spec JAN–R–11; FDR pt #500437	AF output cathode resistor
R260		Not used	
R261		Same as R201	AF feedback divider
R262		Same as R101	J203 decoupling
R263		Same as R101	J205 decoupling
R264		Same as R101	J204 decoupling
R265	N16–R–49842–231	RESISTOR, fixed: comp; JAN type RC30BF681K; 680 ohms ±10%; 1 w; spec JAN–R–11; FDR pt #500707	150 v filter
R266		Same as R112	2nd mixer grid parasitic suppressor
R267		Same as R112	2nd if amplr grid parasitic suppressor
R268		Same as R112	3rd if amplr grid parasitic suppressor
R301	N16–R–49320–491	RESISTOR, fixed: comp; JAN type RC42BF220K; 22 ohms ±10%; 2 w; spec JAN–R–11; FDR pt #502285	B— bleeder divider
R302	N16–R–49923–531	RESISTOR, fixed: comp; JAN type RC42BF102K; 1000 ohms ±10%; 2 w; spec JAN–R–11; FDR pt #502305	Bleeder
R303		Same as R302	Bleeder
R304		Not used	
R305		Not used	
R306		Same as R257	Neon lamp series resistor
R307	N16–R–49941–521	RESISTOR, fixed: comp; JAN type RC42BF122K; 1200 ohms ±10%; 2 w; spec JAN–R–11; FDR pt #502306	Regulator series dropping

TABLE 8–2. TABLE OF REPLACEABLE PARTS (Cont)

REFERENCE DESIGNATION	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
R308		Same as R307	Regulator series dropping
R309		Same as R302	Regulator dropping
R310		Same as R307	Regulator series dropping
R401		Same as R128	Scan output termination (p/o E401)
R501	N16–R–89956–7015	RESISTOR, variable: ww; JAN type RA20A1RD500AK; 50 ohms ±10%; 2 w; "A" taper; round shaft 7/8" lg x 1/4" dia; spec JAN–R–19; FDR pt #585003	Dial lamp dimmer
R502	N16–ER–057142–0502	RESISTOR, variable: comp; JAN type RV3ATSC102C; 1000 ohms ±10%; 1/4 w; taper "C"; 1/4" dia x 3/4" lg slotted shaft; spec JAN–R–94; FDR pt #585003	Phone level adjust
S201	N17–S–71894–1544	SWITCH, toggle; JAN type ST42D; SPDT; spec JAN–S–23; FDR pt #828215	Align-Rec selector
S202		Same as S201	Noise limiter on-off
S203	N17–S–59261–8262	SWITCH, rotary: single section, 2 positions, 5 contact, no pole, rotor shorts and unshorts cont, ceramic body; 1-7/8" lg x 1-35/64" wd x 1-1/16" thk; 3/4" lg x 1/4" dia shaft; 3/8–32 thd x 3/8" lg mtg bushing; FDR dwg #A1003709	Crystal manual tuning control
S301	N17–S–69903–9979	SWITCH, thermostatic; bimetal type; SPST normally open; close at 120°F ±4°F; 10°F operating differential; 10 amp 230 v; 2-3/8" lg x 1-5/8" wd x 31/32" deep o/a; one 5/32" dia mtg hole 5/32" from ea end on center line; 2 screw term; SPTD type C–4351–17, FDR dwg #A1003446	Control for BL301
S501		Same as S201	Silencer IN-OUT
S502	N17–S–72828–2605	SWITCH, toggle: DPST; JAN type ST52K; 6 amp, 125 v; spec JAN–S–23; FDR pt #828238	Power ON-OFF
T201	N16–ET–057142–0201	TRANSFORMER, IF: 18.6 mc peak frequency, interstage; shielded; 1-1/8" lg x 1-1/8" wd x 2-31/32" h; tuned secondary, powdered iron core, ceramic capacitor tuning and adj iron core; two 6–32 thd mtg studs 1.125" c to c 4 solder hug term FDR pt #A1013002	1st if amplr input
T202	N16–ET–057142–0202	TRANSFORMER, IF: 18.6 mc; interstage; shielded; 1-1/8" lg x 1-1/8" wd x 2-31/32" h; double tuned; powdered iron core; ceramic forms; tuned by two 100 mmf ceramic capicitors and adj iron core; two 6–32 thd mtg studs; 1.125" c to c; 4 solder lug term; FDR pt #A1013003	Interstage coupling
T203	N16–ET–057142–0203	TRANSFORMER, IF: 16.8250 mc peak frequency; oscillator; shielded; 1-1/8" lg x 1-1/8" wd x 2-31/32" h; tuned secondary only; powdered iron core; ceramic form; ceramic capacitor tuning and adj iron core; two 6–32 thd mtg studs 1.125" c to c; 4 solder lug term; FDR pt #A1013004	2nd osc plate transformer
T204	N16–ET–057142–0204	TRANSFORMER, IF: 1.775 mc peak frequency; interstage; shielded; 1-1/8" lg x 1-1/8" wd x 2-31/32" h; double tuned; powdered iron core; ceramic form; tuned with two ceramic capacitors, resistors and adj iron core; two 6–32 thd mtg studs 1.125" c to c; 4 solder lug term; FDR pt #A1013005	Interstage coupling

T205	N16–ET–057142–0205	TRANSFORMER, IF: 1.775 mc peak frequency; interstage; shielded; 1-1/8" lg x 1-1/8" wd x 2-31/32" h; double tuned; powdered iron core; ceramic form; tuned with 2 ceramic capacitors and adj iron core; two 6–32 thd mtg studs 1.125" c to c; 4 solder lug term; FDR pt #A1013006	Interstage coupling
T206		Same as T204	Interstage coupling
T207		Same as T205	Interstage coupling
T208		Same as T204	Interstage coupling
T209	N17–T–65494–3101	TRANSFORMER, AF: plate coupling type; pri 10,000 ohms, secd 60 ohms ct; hs metal case; 1-5/8" lg x 1-5/8" wd x 2-1/2" h; 600 milliwatts at 1000 cyc max audio operating level; ±2 db 350 to 3500 cyc; 5 ins solder term; two #6–32 thd mtg studs, 1-1/8" c to c; FDR spec #RC7899–1	AF output
T210	N16–ET–057142–0210	TRANSFORMER, IF: 1.775 mc peak frequency; AGC; shielded; 1-1/8" lg x 1-1/8" wd x 2-31/32" h; tuned secondary only; powdered iron core; ceramic form tuned with one ceramic capacitor and adjustable iron core; two 6–32 thd mtg stud 1.125" c to c; 4 solder lug term; FDR pt #A1013001	AGC silencer amplr plate load
T301		TRANSFORMER, power, step-down and step-up; fil and plate type; 3 pri and 4 secd wdg; input 105/115/125 v ac, 60 cyc, 1 phase, 1 amp; secd #1–5.0 v, 3.0 amp; secd #2–6.3 v, 4.1 amp; secd #3–470 v ct, 0.145 amp; secd #4–63 v ct, 0.6 amp; hs metal case; 4-1/2" lg x 2-13/16" wd x 3-5/16" h; 14 ceramic ins term on top of case; four #8–32 mtg holes on bottom of case; FDR spec #RC8115–1	Fil and plate power
V101	N16–T–56191–50	ELECTION TUBE: JAN type 5654/6AK5W; miniature pentode; spec JAN–1A; FDR pt #700561	1st rf amplr
V102		Same as V101	1st rf amplr
V103		Same as V101	2nd rf amplr
V104		Same as V101	2nd rf amplr
V105	N16–T–75670	ELECTRON TUBE: JAN type 5670; twin triode; spec JAN–1A; FDR pt #700563	Mixer
V106		Same as V105	Osc and 1st doubler
V107		Same as V105	2nd doubler
V108		Same as V101	Tripler
V109		Same as V101	Tripler
V201		Same as V101	1st if amplr
V202		Same as V101	Scan channel amplr
V203		Same as V105	2nd osc-mixer
V204		Same as V101	2nd if amplr
V205		Same as V101	3rd if amplr
V206	N16–T–56195–50	ELECTRON TUBE: JAN type 5726/6AL5W; miniature twin diode; spec JAN–1A; FDR pt #700561	AF det. noise limiter diode
V207		Same as V101	AGC silencer amplr

TABLE 8–2. TABLE OF REPLACEABLE PARTS (Cont)

REFERENCE DESIGNATION	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
V208		Same as V206	AGC silencer diode
V209		Same as V105	1st and 2nd af amplr
V210	N16–T–56192	ELECTRON TUBE: JAN type 6AK6; miniature pentode amplifier; spec JAN–1A; FDR pt #700118	AF output tube
V301	N16–T–75931	ELECTRON TUBE: JAN type 5931; full-wave rectifier; spec JAN–1A; FDR pt #701126	Rectifier
V302	N16–T–52001–5	ELECTRON TUBE: JAN type OB2; miniature type voltage regulator; spec JAN–1A; FDR pt #700003	Voltage regulator
V303	N16–T–52001	ELECTRON TUBE: JAN type OA2; miniature voltage regulator; spec JAN–1A; FDR pt #700001	Voltage regulator
*W601		CABLE ASSEMBLY, RF: c/o 48" lg RG–58/U cable w/JAN type connector UG–347/U at one end and JAN type UG–348/U connector at other end; FDR pt #A1004142, dwg #B1004140	Antenna test cable
*W602		CABLE ASSEMBLY, power: c/o 48" lg MIL–C–915 type FR1P–3 cable w/SNSN 17–C–73487–7175 receptacle on one side and SNSN 17–C–73194–4231 receptacle on other side; FDR pt #A1004141, dwg #B1004139	Power and audio test cable
XC237	N16–S–63462–8201	SOCKET, electron tube: octal; ceramic body; 1-1/4" dia x 7/8" h; SS mtg plate w/two 6–32 tapped holes 1-5/8" c to c; AMP cat no. 49–816 (300), FDR dwg #A1000641	Receptacle for C237
XF201	N17–F–74267–5075	FUSEHOLDER: extractor post type; for type 3AG glass fuse; bakelite body, 2" lg w/o term, 2-13/32" lg w/term x 11/16" dia; 15 amp 280 v rating; 1/2–24 thd x 1/2" lg mtg bushing; BUS HKP–JE, FDR dwg #A1001394	Holder for F201
XF202		Same as XF201	Holder for F202
XI501	N17–L–51624–6963	LAMPHOLDER: for miniature bayonet base lamps; 1-1/4" lg x 1/2" wd x 1" h; mts by #6–32 x 5/16" lg stud soldered to bkt; 2 solder lug term; DLC model 708 mod per FDR dwg #A1001547	Receptacle for I501
XI502		Same as XI501	For I502
XI503	N17–L–76743–3975	LIGHT, indicator: w/clear 1/2" effective, 5/8" dia lens; for T–3–1/4 miniature bayonet base bulb; brass shell; nickel pl; end; 1-3/4" lg w/lens 13/16" across flats; requires 11/16" dia mtg hole; 2 solder lug term; RSW; DLC model PLN–850 mod per FDR dwg #A1001543	Receptacle for I503
XI503A		Not used	
XI503B	N17–L–250181–506	LENS, light indicator: clear; 5/8" dia; hemispherical; plastic; unmounted; 9/16" —27 thd x 3/16" lg; DLC pt #95–937	p/o XI503
XV101		SOCKET, electron tube: 7 cont; miniature; incl metal shock shield and center shield; oval; 1-9/32" lg x 1-1/8" wd x 0.900" h; ceramic body 2 mtg holes 1/8" dia; 7/8" c to c; FDR dwg #A1000378	Receptacle for V101

XV102		Same as XV101	Receptacle for V102
XV103		Same as XV101	Receptacle for V103
XV104		Same as XV101	Receptacle for V104
XV105	N16–EX–057142–0105 –4	SOCKET, electron tube: 9 cont, beryllium copper, silver pl; miniature size; incl metal shield base 5/8″ h x .940″ dia; incl center shield 0.125″ ID; ceramic body; 1-3/8″ lg x .940″ wd x 25/32″ h; one piece saddle mtg two .125″ dia mtg holes 1.125″ c to c; same as JAN type TS103C01 except that centerline of mtg holes and of term 2 shall coincide; FDR dwg #A1011240	Socket for V105
XV106	N16–S–64063–6714	SOCKET, electron tube: JAN type TS103C01; 9 cont, miniature; ceramic body; .940″ dia x 5/8″ h; spec JAN–S–28A; FDR pt #740005	Receptacle for V106
XV107		Same as XV105	Receptacle for V107
XV108		Same as XV101	Receptacle for V108
XV109		Same as XV101	For V109
XV201	N16–S–62603–6700	SOCKET, electron tube: JAN type TS102C01; 7 cont; miniature; ceramic body; .800″ dia x 5/8″ h; spec JAN–S–28A; FDR pt #740003	Receptacle for V201
XV202		Same as XV201	Receptacle for V202
XV203		Same as XV105	Receptacle for V203
XV204		Same as XV201	Receptacle for V204
XV205		Same as XV201	Receptacle for V205
XV206		Same as XV201	Receptacle for V206
XV207		Same as XV201	Receptacle for V207
XV208		Same as XV206	Receptacle for V208
XV209		Same as XV106	Receptacle for V209
XV210		Same as XV201	Receptacle for V210
XV301		Same as XC237	Receptacle for V301
XV302		Same as XV201	Receptacle for V302
XV303		Same as XV201	Receptacle for V303
XY201		CRYSTAL HOLDER: c/o XY201A, XY201B, XY201C	Receptacle for Y201
XY201A	N17–C–804081–101	CLIP, electrical: crystal clip; #28 (.0126) B&S ga beryllium copper, nickel pl, and silver pl; 13/16″ lg x .248″ wd x 3/16″ h; one 1/16 (.062) drill hole 1/16″ from one end and one #30 (.128) drill hole 3/8″ from other end; FDR dwg #A1001386	Y201 holder
XY201B	N17–C–812323–101	CLIP, electrical: "U" shaped; #30 (.010) B&S ga beryllium copper, nickel pl; .406″ lg x 9/16″ wd x .440″ h; for grounding; FDR dwg #A1001388	Y201 grounding
XY201C	N17–I–49498–7025	INSULATOR, bushing: natural mica filled molded phenolic type MFE per spec MIL–P–14B; .437″ lg x 1/2″ dia; one #30 (.128) drill hole through center, one .250″ wide x .031″ deep groove in center on top; FDR dwg #A1001387	Insulator for XY201

* Not furnished as a maintenance part. If failure occurs do not request replacement unless item cannot be replaced or fabricated.

TABLE 8–2. TABLE OF REPLACEABLE PARTS (Cont)

REFERENCE DESIGNATION	STANDARD NAVY STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
XY202	N16–S–54287–5051	SOCKET, crystal: 2 contact holes for .050″ dia pins .486″ c to c; beryllium copper cont silver pl; oval shape; 55/64″ lg x 3/8″ wd x 3/8″ h; steatite body; one .125″ dia mtg hole in center; EBY type CR–7 cat. no. 9006, FDR pt #943019	Receptacle for Y202
Y201	***	CRYSTAL UNIT, quartz: 5th mode JAN type CR–24/U (NOT FURNISHED)	Oscillator control
Y202		CRYSTAL UNIT, quartz: MIL spec type CR–23/U; one crystal plate; 16.8250 mc nominal frequency; HC–6/U holder, oval shape; 1.031″ lg x .750″ wd x .345″ h; ±0.005% tolerance over −55° to 90°C; spec MIL–C–3098; FDR dwg #A1018486	2nd osc
Z101	Assemble from component parts	RECEIVER SUBASSEMBLY: c/o rf coil L123, capacitor C137, C155, C160, resistors R111, R112, R114, R115, R116, R129 and XV106; 2-15/32″ lg x 1-3/8″ wd x 1-1/2″ h o/a; four open slots 0.130″ wd in ends for mtg screws 7/16″ x 2-5/16″ c to c; FDR pt #A1001076, dwg #B1001077	Oscillator and 1st rf doubler socket plate
Z102	Assemble from component parts	RECEIVER SUBASSEMBLY: c/o capacitor C157 and tube socket XV107; 2-7/32″ lg x 13/16″ wd x 1-1/4″ h; four open slots 0.130″ wd in ends 7/16″ x 2-5/16″ c to c; FDR pt #A1000439, dwg #A1000440	2nd rf doubler socket plate
Z103	Assemble from component parts	RECEIVER SUBASSEMBLY: c/o capacitors C133, C134, C139, resistors R122, R123, sockets XV108, XV109; 2-1/2″ lg x 1-1/4″ wd x 3-1/4″ h; four open slots (0.130″ wd) in ends for mtg screws 2-3/8″ x 1″ c to c; FDR pt #A1000415–1	RF tripler socket plate and shield
Z104	Assemble from component parts	RECEIVER SUBASSEMBLY: c/o capacitors C103, C104, C150, resistors R102, R103, R126 and tube sockets XV101, XV102; 2-1/2″ lg x 1-1/4″ wd x 2-1/4″ h; four open mtg slots in ends 7/16″ x 2-5/16″ c to c; FDR pt #A1000375–11, dwg #B1000376	1st rf amplr socket plate
Z105	Assemble from component parts	RECEIVER SUBASSEMBLY: c/o capacitors C106, C107, C152, resistors R106, R107, R127, tube sockets XV103, XV104; 2-1/2″ lg x 1-1/4″ wd x 2-1/4″ h; four open mtg slots in ends 7/16″ x 2-5/16″ c to c; FDR pt #A1000375–2; same as Z104 except for stamping	2nd rf amplr socket plate
Z106	Assemble from component parts	RECEIVER SUBASSEMBLY: c/o capacitors C153, C119, and socket XV105; 2-1/2″ lg x 1-1/8″ wd x 1-1/8″ h; four open slots in ends 11/16″ x 2-5/16″ c to c; FDR pt #A1000417, dwg #A1000418	Mixer socket plate
Z107	N16–EZ–057142–0107	AMPLIFIER-CONVERTER: frequency range 225–400 mc; includes rf amplifier stages and oscillator-multiplier stages; rectangular metal box 11-3/4″ lg x 4-7/8″ wd x 6″ h; FDR pt #A1001130–1	Preselector assembly

*** Standard Navy Stock Numbers assigned by frequency.

TABLE 8–3. MAINTENANCE PARTS KIT

KEY DESIGNATION	QUANTITY
C105	5
C116	1
C118	2
C161	1
C201	2
C205	2
C401	2
L301	1
T201	1
T202	1
T204	1
T205	1
T209	1
T301	1
Y202	1

TABLE 8–4. CROSS-REFERENCE PARTS LIST

STANDARD NAVY STOCK NUMBER	KEY SYMBOL
N16–C–15368–5888	C108
N16–C–15400–5867	C110
N16–C–15528–5523	C210
N16–C–15625–4061	C126
N16–C–15988–1600	C121
N16–C–16051–3074	C118
N16–C–16533–1248	C129
N16–C–17085–7060	C204
N16–C–18657–8640	C116
N16–C–18659–4509	C105
N16–C–19892–7801	C301
N16–C–28975–1601	C117
N16–C–29265–3006	C159
N16–C–29375–8076	C220
N16–C–30114–4276	C208
N16–C–30167–1876	C153
N16–C–30167–1887	C133
N16–C–31090–3800	C403
N16–C–31512–4608	C234
N16–C–32646–6808	C227
N16–C–33622–5222	C213
N16–C–46371–9609	C401
N16–C–48841–9605	C302
N16–C–71585–4777	L118
N16–C–72730–3773	L403
N16–C–72793–6430	L123
N16–C–72909–4533	L201
N16–C–74411–7351	L405
N16–C–74458–4712	L401
N16–C–300798–866	O201
N16–C–600701–118	L119
N16–C–600701–120	L115A
N16–C–600701–121	L114A
N16–C–600701–137	L117A
N16–EC–057142–0103	C103
N16–EC–057142–0119	C119
N16–EC–057142–0161	C161
N16–EC–057142–0201	C201
N16–EC–057142–0205	C205
N16–EC–057142–0228	C228
N16–EC–057142–0237	C237
N16–EE–057142–0110	E110
N16–EH–057142–0502	H502
N16–EJ–057142–0202	J202
N16–ER–057142–0247	R247
N16–ER–057142–0255	R255
N16–ER–057142–0502	R502
N16–ET–057142–0201	T201
N16–ET–057142–0202	T202
N16–ET–057142–0203	T203
N16–ET–057142–0204	T204
N16–ET–057142–0205	T205
N16–ET–057142–0210	T210
N16–EX–057142–0105–4	XV105
N16–EZ–057142–0107	Z107
N16–G–432816–277	O103
N16–K–700266–740	E502
N16–K–700277–350	E503
N16–K–700310–977	E212
N16–K–700344–505	F501
N16–M–60906–8018	O202
N16–R–29693–5271	L301
N16–R–49238–811	R112
N16–R–49320–491	R301
N16–R–49365–485	R244
N16–R–49427–811	R128
N16–R–49580–811	R241
N16–R–49624–431	R111
N16–R–49661–811	R202
N16–R–49706–811	R259
N16–R–49769–811	R126
N16–R–49841–811	R208
N16–R–49842–231	R265
N16–R–49922–811	R225
N16–R–49923–531	R302
N16–R–49940–811	R216
N16–R–49941–521	R307
N16–R–49967–811	R119
N16–R–50012–811	R204
N16–R–50013–231	R113
N16–R–50066–811	R220
N16–R–50067–231	R104
N16–R–50129–811	R201
N16–R–50281–431	R243
N16–R–50282–811	R205
N16–R–50336–811	R114
N16–R–50372–811	R102
N16–R–50417–811	R249
N16–R–50480–811	R110
N16–R–50551–431	R240
N16–R–50552–811	R120
N16–R–50633–811	R101
N16–R–50678–811	R257
N16–R–50759–811	R246
N16–R–50822–811	R109
N16–R–50893–431	R237
N16–R–50975–811	R228
N16–R–51020–811	R250
N16–R–51037–431	R238
N16–R–89956–7015	R501
N16–S–32841–1004	L101
N16–S–34518–5501	E101
N16–S–34520–3864	E218
N16–S–34532–8760	E105
N16–S–34557–8351	E227
N16–S–34607–6039	E304
N16–S–54287–5051	XY202
N16–S–62603–6700	XV201
N16–S–63462–8201	XC237
N16–S–64063–6714	XV106
N16–T–52001	V303
N16–T–52001–5	V302
N16–T–56191–50	V101
N16–T–56192	V210
N16–T–56195–50	V206
N16–T–75670	V105
N16–T–75931	V301
N17–B–21188–1075	BL301
N17–C–70328–1515	P401
N17–C–70328–1545	O405
N17–C–70334–5473	P402
N17–C–71408–3241	P403
N17–C–71416–2550	P404
N17–C–72604–1522	J401
N17–C–72610–5429	J402
N17–C–73108–1262	J403
N17–C–73108–1267	J101
N17–C–73108–6037	J406
N17–C–73109–4976	J404
N17–C–73194–4231	J405
N17–C–73408–7101	P101
N17–C–73487–7175	P301
N17–C–77415–7611	E505
N17–C–77417–8070	E507
N17–C–98378–2225	O503
N17–C–804081–101	XY201A
N17–C–812323–101	XY201B
G17–F–16302–100	F201
N17–F–74267–5075	XF201
N17–I–49498–7025	XY201C
N17–J–39248–4423	J501
G17–L–6297	I501
G17–L–6806–130	I503
N17–L–51624–6963	XI501
N17–L–76743–4975	XI503
N17–L–250181–506	XI503B
N17–M–19255–1051	M501
N17–M–22724–6701	M502
N17–M–75268–6626	A501
N17–S–38251–1015	O105
N17–S–59261–8262	S203
N17–S–69903–9979	S301
N17–S–71894–1544	S201
N17–S–72828–2605	S502
N17–S–250051–153	O401
N17–T–65494–3101	T209
N17–T–68163–6371	L122
G77–B–999–75008–0100	O102

JAN/MIL DESIGNATION	KEY SYMBOL
CC21CJ030C	C210
CC21CK010C	C108
CC21CK1R5C	C110
CC21SH050C	C126
CC21SH150K	C121
CC21UJ470J	C129
CC26SL101K	C204
CE41B350Q	C301
CE50C700M	C237
CM20B221K	C220
CM20B471K	C208
CM20C151J	C117
CM20D201J	C159
CM35B103K	C213
CM35B152K	C234
CM35B472K	C227
CP06SA6	O202
CP61B1EF105V	C302
CP61B6EF504X	C228
CR–23/U	Y202
CR–24/U	Y201
JAN–0A2	V303
JAN–0B2	V302

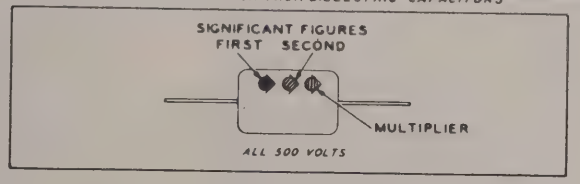
TABLE 8–4. CROSS-REFERENCE PARTS LIST (Cont)

JAN/MIL DESIGNATION	KEY SYMBOL	JAN/MIL DESIGNATION	KEY SYMBOL	ARMY-NAVY TYPE	KEY SYMBOL	NAVY/BUSHIPS DWG. NO.	SYMBOL KEY
JAN–6AK6	V210	RV3ATSA504C	R255	AN3057–6	O405	RE49AA195	J501
JAN–5654/6AK5W	V101	RV3ATSC102C	R502	AN3102A–14S–2P	J402	RE49AA399B	E401
JAN–5670	V105	ST42D	S201	AN3102A–14S–7P	J401	RE49F488B	P101
JAN–5726/6AL5W	V206	ST52K	S502	AN3106A–14S–2S	P402		
JAN–5931	V301	TS102C01	XV201	AN3106A–14S–7S	P401		
MR25W001DCMA	M501	TS102U01	E218				
RA20A1RD500AK	R501	TS102U02	E227				
RC20BF100K	R112	TS102U03	E304				
RC20BF101K	R241	TS103C01	XV106				
RC20BF102K	R225	TS103U01	E105				
RC20BF103J	R243	UG–21B/U	P404				
RC20BF103K	R205	UG–88/U	P403				
RC20BF104K	R101	UG–177/U	O401				
RC20BF105K	R228	UG–290/U	J101				
RC20BF122K	R216	UG–291/U	J403				
RC20BF151J	R111	UG–347/U	P101				
RC20BF152K	R119	UG–348/U	J406				
RC20BF153K	R114						
RC20BF154K	R257						
RC20BF155K	R250						
RC20BF185J	R238						
RC20BF222K	R202						
RC20BF222K	R204						
RC20BF223K	R102						
RC20BF331K	R259						
RC20BF332K	R220						
RC20BF333K	R249						
RC20BF334K	R246						
RC20BF470K	R128						
RC20BF471K	R126						
RC20BF472K	R201						
RC20BF473K	R110						
RC20BF474K	R109						
RC20BF681K	R208						
RC20BF683J	R240						
RC20BF683K	R120						
RC20BF684J	R237						
RC30BF222K	R113						
RC30BF332K	R104						
RC30BF681K	R265						
RC42BF102K	R302						
RC42BF122K	R307						
RC42BF220K	R301						
RC42BF330K	R244						
RV3ATSA204A	R233						
RV3ATSA253A	R247						
RV3ATSA502A	R218						

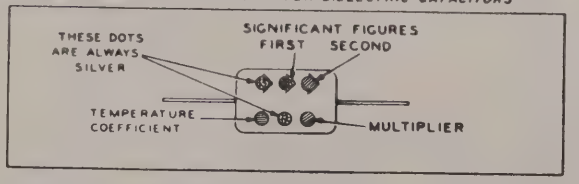
TABLE 8–5. APPLICABLE COLOR CODES AND MISCELLANEOUS DATA

CAPACITOR COLOR CODES

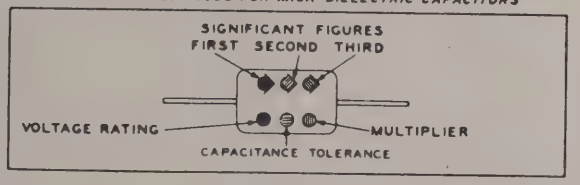
RMA 3-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS



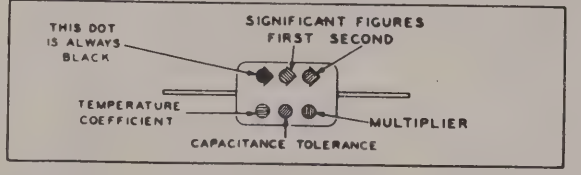
JAN 6-DOT COLOR CODE FOR PAPER-DIELECTRIC CAPACITORS



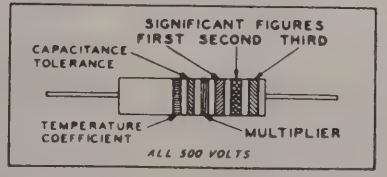
RMA 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS



JAN 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS

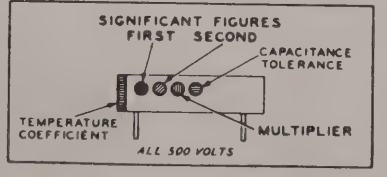


RMA COLOR CODE FOR TUBULAR CERAMIC-DIELECTRIC CAPACITORS

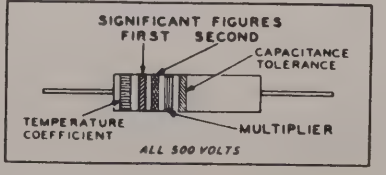


JAN COLOR CODE FOR FIXED CERAMIC-DIELECTRIC CAPACITORS

RADIAL TYPE NON-INSULATED



AXIAL TYPE INSULATED



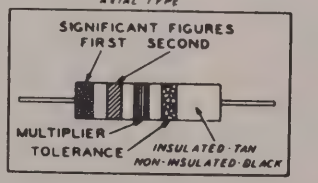
RMA: RADIO MANUFACTURERS ASSOCIATION
JAN: JOINT ARMY-NAVY

RESISTORS		CAPACITORS						
TOLERANCE	MULTIPLIER	SIGNIFICANT FIGURE	COLOR	MULTIPLIER: RMA MICA AND CERAMIC-DIELECTRIC	MULTIPLIER: JAN MICA AND PAPER-DIELECTRIC	MULTIPLIER: JAN CERAMIC DIELECTRIC	VOLTAGE RATING	TEMPERATURE COEFFICIENT
	1	0	BLACK	1	1	1		A
	10	1	BROWN	10	10	10	100	B
	100	2	RED	100	100	100	200	C
	1,000	3	ORANGE	1,000	1000	1000	300	D
	10,000	4	YELLOW	10,000			400	E
	100,000	5	GREEN	100,000			500	F
	1,000,000	6	BLUE	1,000,000			600	G
	10,000,000	7	VIOLET	10,000,000			700	
	100,000,000	8	GRAY	100,000,000		0.01	800	
	1,000,000,000	9	WHITE	1,000,000,000		0.1	900	
5	0.1		GOLD	0.1	0.1		1000	
10	0.01		SILVER	0.01	0.01		2000	
20			NO COLOR				500	

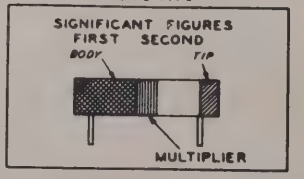
RESISTOR COLOR CODES

RMA COLOR CODE FOR FIXED COMPOSITION RESISTORS

AXIAL TYPE

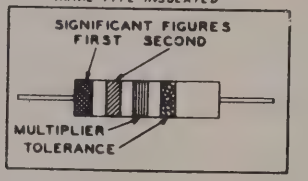


RADIAL TYPE



JAN COLOR CODE FOR FIXED COMPOSITION RESISTORS

AXIAL TYPE INSULATED



RADIAL TYPE NON-INSULATED

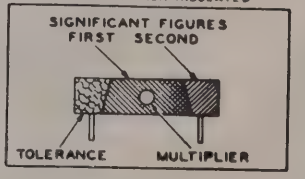


TABLE 8-6. LIST OF MANUFACTURERS

CODE	PREFIX	NAME	ADDRESS
AAGB		Air-Marine Motors, Inc.	2184 Jackson Ave., Seaford, N. Y.
AAP		Induction Motors Corp.	55-15 37th Ave., Woodside, N. Y.
AMA	CBEN	Air-Maze Corp.	5200 Harvard Ave., Cleveland, Ohio
AMP	CPH	American Phenolic Corp.	1830 S. 54th Ave., Chicago 50, Ill.
BHE	CAIS	Birtcher Corp.	4371 Valley Blvd., N. Los Angeles 32, Calif.
BLC	CAYU	The Barry Corp.	700 Pleasant St., Watertown 72, Mass.
BUS	CFA	Bussman Mfg. Co.	2538 W. University St., St. Louis 7, Mo.
DLC	CAYZ	Dial Light Co. of America, Inc.	900 Broadway, New York 3, N. Y.
EAD	CARB	Eastern Air Devices, Inc.	585 Dean St., Brooklyn 17, N. Y.
EBY	CEB	Hugh H. Eby, Inc.	4700 Stenton Ave., Philadelphia, Pa.
ELRC	CAW	Hi-Q Div., Aerovox Corp.	1001 Seneca St., Olean, N. Y.
ERC	CER	Erie Resistor Corp.	644 W. 12th St., Erie, Pa.
ERM		Erie Mfg. Co.	N. 8th St. at W. Hinman, Milwaukee 3, Wis.
FAF		The Fafnir Bearing Co.	39 Booth St., New Britain, Conn.
FDR	CFT	Federal Telephone and Radio Corp.	100 Kingsland Rd., Clifton, N. J.
GE	CG	General Electric Co.	1 River Rd., Schenectady 5, N. Y.
IPC	CARO	Industrial Products Co.	Brookfield St., Danbury, Conn.
JON	CEJ	E. F. Johnson Co.	Waseca, Minn.
ND	CGM	New Departure Div., General Motors Corp.	1953 Thomas St., Bristol, Conn.
SH	CAXO	Shakeproof, Inc., Div. of Illinois Tool Works	2501 N. Keeler Ave., Chicago 39, Ill.
SPR	CSF	Sprague Electric Co.	125 Marshal St., North Adams, Mass.
SPTD	CSQ	Spencer Thermostat Div., Metals and Controls Corp.	34 Forest St., Attleboro, Mass.
STSB		Strom Steel Ball Co.	1850 S. 54th Ave., Cicero 50, Ill.
WIQ		Winchester Electronics Co.	Glenbrook, Conn.
WS	CV	Weston Electrical Instrument Corp.	614 Frelinghuysen Ave., Newark 5, N. J.

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